

A Taxonomic Revision of *Bulbophyllum* (Orchidaceae) 2. Sections *Altisceptrum* and *Hirtula**

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Abstract

Bulbophyllum sect. *Altisceptrum* and sect. *Hirtula* (Orchidaceae) are revised. Both sections are distributed in South and East Asia, and Malesia. The two sections together include 49 species and 1 subspecies. The investigations leading to this paper yielded 25 new species. Many of these have been described in precursors to this revision, eight are described here as new: *B. sororculum*, *B. lanuginosum*, *B. grotianum*, *B. scaphiforme*, *B. comberipictum*, *B. ochthodes*, *B. deprincatae*, and *B. pilosum*. All species (except one) are illustrated.

Introduction

The present revision is a continuation of Vermeulen (1993); consequently, the introductory chapters 2 to 6 in that first instalment of the series largely apply to this revision. The numbering of the species is also continued. This revision therefore starts with species number 111. Whereas the sections of *Bulbophyllum* revised in the first instalment occur almost exclusively in East Malesia, sect. *Altisceptrum* and sect. *Hirtula* are predominantly from South and East Asia, and West Malesia. The species in both sections have racemose inflorescences.

Section *Altisceptrum* includes 9 species and 1 subspecies. These are large plants that are rather similar to the racemose series of sect. *Sestochilus*, but they generally differ in having long and narrow, 1-veined petals. On the whole, the delimitation of the species is rather straightforward, although a re-evaluation of *B. disjunctum sensu* Vermeulen (1991: 21) led to its division into two distinct species and one subspecies. *Bulbophyllum gymnopus* Hook.f. is included in the section; it had recently been placed in *Drymoda* Lindl. by Garay *et al.* (1994: 641).

Section *Hirtula* comprises 40 species. These are generally characterised by the presence of 1-celled hairs on the flowers, particularly on the petals and the lip. Most species are rather rare in nature, and only sparsely represented in collections. This tends to make a taxonomist's life deceptively easy, but in fact the reliability of the revision suffers because the delimitation of the species relies on the taxonomist's intuition rather than on the evaluation of a representative set of specimens. Only one of

* continued from *Orchid Monographs* 7 (1993): 1–324

the commoner species, *B. hirtulum* Ridl., was found to display more than average infraspecific variability. Apart from this, confusion about the identity of *B. nigrescens* Rolfe, *B. nigripetalum* Rolfe, and *B. secundum* Hook.f. (see Seidenfaden, 1979) has been resolved, and a re-evaluation of the Thai material of *B. penicillium* Par. & Rchb.f. in Rchb.f. has led to its description as a new species.

Although this revision includes only 8 new species, no fewer than 25 species out of the 49 included have been described as new by the present author over the last 10 years. The present revision presents the first full plates of many of these.

Extinct species. Several species are marked in this revision as 'probably extinct'. This is defined here as not having been found for at least 50 years, following the IUCN definition of the term 'extinct'. However, many supposedly extinct plant species that were collected long ago occur in areas that are only rarely visited by botanists. The species may be extinct, particularly if they were found in lowland areas, but they may still be present, unnoticed, in remote remnants of Asia's forests.

Section *Altisceptrum* J.J. Sm.

Bulbophyllum sect. *Altisceptrum* J.J. Sm., Bull. Jard. Bot. Buitenzorg, s. 2, 13 (1914)

34. – LECTOTYPE: *Ephippium elongatum* Blume [= *Bulbophyllum elongatum* (Blume) Hassk.], here designated.

Rhizome creeping, scales usually covering rhizome, pseudobulbs and leaf bases before disintegrating. *Roots* predominantly sprouting below the pseudobulbs. *Pseudobulbs* 1-leafed, not or hardly laterally flattened, wrinkling along pre-determined longitudinal lines or in a random pattern with age. *Inflorescence* with many flowers. *Rhachis* not swollen when compared to the peduncle. *Floral bracts* patent to reflexed. *Flowers* spirally arranged, sometimes partly in whorls (*penduliscapum*, *elongatum*), not resupinate, or resupinate (*gymnopus*), not fully opening, many simultaneously. *Pedicel* and *ovary*: basal node usually more or less flush with the surface of the rhachis, or on a stump up to 2 mm high (*gymnopus*). *Median sepal* porrect or somewhat recurved with an incurved top part, 3-veined. *Lateral sepals* free, recurved to spreading, 3-veined. *Petals* linear, often gradually tapering from a wide base, or elliptic to obovate with a linear, long drawn-out top part (*nemorale*), margins usually erose-denticulate, sometimes entire or papillose-ciliate; the lower margin often decurrent along the column foot, 1-veined, or 2–3-veined (*nemorale*). *Lip* usually without a median slit, rarely with a median slit (*fulvibulbum*), glabrous or finely papillose locally, thin to thick but not fleshy. *Column*:

stigma not protruding at its base; column foot elongated in several species, leaving a gap between the median and lateral sepals that is not filled entirely by the petals (distinctly present in *gymnopus*; moderately distinct in *elongatum*, slight in *placochilum* and *lissoglossum*); column foot otherwise without accessories. *Stelidia* distinct, triangular to linear, often subulate, often with a small tooth along the upper margin and a narrow wing along the lower, at the base. *Anther* abaxially with a papillose ridge near its base; frontal part not or hardly projecting, front margin glabrous to papillose. *Pollinia* 4; the inner $\pm$ half as long as the outer or longer, flattened on both sides; the outer flattened on one side. Stipes absent.

Distribution. Bhutan (1 taxon), India (1), Thailand (2), Peninsular Malaysia (3), Sumatra (2), Java (1), Borneo (7, of which 5 are endemics), Philippines (3), New Guinea (2).

Delimitation of the section. Section *Altisceptrum* is very similar to the racemose series of sect. *Sestochilus*. The main distinctive characters lie in the petals: although slightly varying in shape, they all consist of a wide basal part tapering into a long, linear top part. They usually have one vein.

While most have petals with 3 or more veins, some racemose species of sect. *Sestochilus* also have 1-veined petals: *Bulbophyllum pachyphyllum* J.J. Sm., *B. tahanense* Carr, *B. univenum* J.J. Verm., and *B. wrayi* Hook.f. These have distinctly shorter and wider petals than sect. *Altisceptrum*, and entire and glabrous margins. *Bulbophyllum nemorale* L.O. Williams, of sect. *Altisceptrum*, has petals with three veins, and *B. elongatum* (Blume) Hassk., has petals with entire and glabrous margins. On account of overall similarity, both have been included in sect. *Altisceptrum*.

Garay *et al.* (1994) transferred *Bulbophyllum gymnopus* to the genus *Drymoda* Lindl., on account of the presence of a gap between the petals and the lateral sepals. *Drymoda* otherwise includes minute plants with deciduous leaves, 1-flowered inflorescences, and flowers with a lip of a different shape, and a column with projecting teeth along the lower margin of the stelidia. *Bulbophyllum gymnopus* is not obviously similar; it fits better in sect. *Altisceptrum*. The displacement of the basal node of the pedicel, the resupinate flowers, and the wide gap between the petals and lateral sepals are unique characters for the species within the section; the last character occurs, less distinctly, in several other species of sect. *Altisceptrum*.

Bulbophyllum phreatiopsis J.J. Verm., here included in sect. *Hirtula*, has petals with papillose-ciliolate margins, but these are shorter and wider than in sect. *Altisceptrum*.

In spite of these species, sect. *Altisceptrum* possesses an overall distinctness when compared with sect. *Sestochilus*, mainly through its rather small, spidery flowers. It is therefore best to maintain it as a separate

group. J.J. Smith originally listed three species: *Bulbophyllum elongatum* (Blume) Hassk., *B. penduliscapum* J.J. Sm., and *B. pachyphyllum* J.J. Sm. The latter is best included in the racemose series of sect. *Sestochilus* for reasons given above. Otherwise J.J. Smith's concept of the section is followed.

Monophyly. It seems reasonable to assume monophyly *a priori* on account of a rather marked overall similarity of the species. Section *Sestochilus* seems the most likely outgroup; however, sect. *Altisceptrum* may well be nested within sect. *Sestochilus*. If this were true, its status as a separate section would leave *Sestochilus* as a paraphyletic group.

Cultivation. Five species have been cultivated in recent years. The general rules for growing *Bulbophyllum* apply here: semi-shade, a substrate with some 'soft' organic matter that is never allowed to dry out entirely, high air humidity and abundant air movement. High air humidity seems particularly important except, possibly, for *B. gymnopus*. The plants grow rather easily on tree-fern slabs, with some sphagnum or other soft material among the roots when mounted to help them settle, or in baskets with a potting mix containing sufficient soft organic matter. However, *B. penduliscapum* is growing well outdoors in Singapore in a small pot mainly filled with medium-sized charcoal chips. *Bulbophyllum disjunctum* often occurs abundantly in its natural habitat but is rarely found in flower. It may continue this habit of shy flowering when taken into cultivation.

Key to Species of *Bulbophyllum* sect. *Altisceptrum*

1. Leaf tip rounded to obtuse (check undamaged leaves)
 2. Inflorescence pendulous. Veins of rhizome bracts persistent as a whorl of stiff, erect bristles around the pseudobulb 111. **B. penduliscapum**
 2. Inflorescence erect to patent. Veins of rhizome bracts more or less decaying with the bract itself
 3. Lateral sepals 5—8 mm long. Flowers resupinate: column foot directed towards the base of the inflorescence 112. **B. gymnopus**
 3. Lateral sepals 10—22 mm long. Flowers not resupinate: column foot directed towards the tip of the inflorescence
 4. Median sepal 2—3.2 mm wide. Lateral sepals 2.2—3.8 mm wide 113. **B. farinulentum**
 4. Median sepal 3.4—5.3 mm wide. Lateral sepals 4.5—5 mm wide 114. **B. fulvibulbum**
1. Leaf tip acute to acuminate

5. Petals with 3 veins, the laterals sometimes not reaching the base. Petals with an elliptic to obovate basal half and a linear top half ... 115. **B. nemorale**
5. Petals with 1 vein. Petals gradually tapering from a wide base, or a from widest part close to the base
6. Keels on the adaxial side of the lip at the proximal end with two erect to antrorse, obtuse knobs 116. **B. disjunctum**
- 6 Keels on the adaxial side of the lip without knobs, or no keels present
7. Lip orbicular to transversely elliptic in outline (do not spread out!) 117. **B. placochilum**
7. Lip $\pm$ triangular in outline, with or without a projecting, linguiform top
8. Median sepal 12.5—17.5 mm long. Lip 2.4—3 mm wide. Leaves in flowering plants 6—16 cm wide 118. **B. elongatum**
8. Median sepal 8—11.2 mm long. Lip 1—1.8 mm wide. Leaves in flowering plants 2.1—4.5 cm wide .. 119. **B. lissoglossum**

111. *Bulbophyllum penduliscapum* J.J. Sm. — Fig. 1, plate 1.

Bulbophyllum penduliscapum J.J. Sm., Icon. Bogor. 2 (1903) 101. — TYPE: Indonesia, Sumatra, northern part, *Heldt s.n.* (BO, holo., not seen).

Bulbophyllum macrophyllum F. Kraenzl., Bot. Jahrb. Syst. 34 (1905) 249. — TYPE: Malaysia, Sarawak, *Beccari PB 3113* (FI, lecto.; K, isolecto., indicated by Vermeulen, 1991), *PB 1344* (FI).

Bulbophyllum jarensense Ames, Orch. 6 (1920) 301. — TYPE: Philippines, Leyte, Jaro, *Wenzel 761* (PNH holo., destroyed; AMES, K, NY, S, iso.).

Secondary roots erect, growing in dense tufts surrounding the plant. *Rhizome* 6—10 mm diam., sections between pseudobulbs 1.8—4 cm long; bracts soon withering but veins persistent as a whorl of stiff, erect bristles around the pseudobulbs. *Pseudobulbs* close to distant, discoid, 0.5—0.7 x 0.5—1.2 cm. *Petiole* 11—24 cm. *Leaf blade* elliptic, 21—38 x 7.5—15.5 cm, index (length/width) 1.6—2.8; rounded to obtuse. *Inflorescence* a rather dense raceme, with the flowers $\pm$ in whorls of 4—8 towards the tip of the rhachis, pendulous, 23—65 cm, 50—250-flowered. *Peduncle* 9—14 cm, bracts 5—6, the longest 40—60 mm long. *Rhachis* 12—58 cm. *Floral bracts* triangular, 4—7 x 1.5—2 mm, acute. *Pedicel* and *ovary* 3—5 mm long. *Median sepal* ovate to triangular, 8—12 x 1.5—2 mm, index 4.7—6.7; acute to acuminate, margins entire; glabrous or finely papillose locally, base broadly attached; rather thin. *Lateral sepals* slightly oblique, 8—12.5 x 1—2.5 mm, index 4.1—8; otherwise as the median sepal. *Petals* porrect, often falcate, gradually tapering from a wide base, 5—9 x 0.7—0.9(—1.2) mm,

index 7.1—11.3; acute, margins finely erose; glabrous or finely papillose locally, base broadly attached; rather thin. *Lip* recurved in the basal half, triangular, 2—3.5 x 1—1.6 mm, index 2—2.5; obtuse, margins entire or slightly erose and somewhat finely papillose; rather thin; adaxially concave near the base, with 2 distinct, obtuse ridges diverging towards the base and running to about half-way up the lip, space in between channelled, surface glabrous except for a papillose strip proximally along the median line, abaxially with a weak, rounded ridge up to about 1/3 of the length of the lip, surface glabrous. *Column* 2.2—3 mm long. *Stelidia* falcate or not, subulate, 0.8—1.2 mm long, acute, often with a small, antrorse, deltoid, obtuse to acute tooth along the upper margin.

Colours: Sepals pale yellow at the base, yellow at the tip, with large dark purple spots. Petals translucently yellow with similar spots. Lip brownish at the base, yellow at the tip. Column yellowish. Flowers sweetly fragrant, attractive to flies.

Habitat & ecology: Found in *kerangas* forest, forest on limestone, and lower montane forest. Epiphyte growing in large clumps on tree trunks and major branches, catching leaf litter in the dense tangle of secondary roots. Alt. 300–1100 m. Flowering in Feb—Apr, Nov, Dec.

Distribution: MALAYSIA: Peninsula (2 living plants seen); Sarawak (3 specimens seen); Sabah (8). PHILIPPINES: Leyte (2). INDONESIA: Sumatra (2).

Notes: Unmistakable, even without flowers, because of the clustered pseudobulbs, the persistent fibres of the rhizome scales, and the tufts of erect catch-roots. Well-grown, flowering plants can be quite spectacular.

Some variability occurs in the stelidia; these are porrect in some specimens (e.g. the type of *B. jarensense*) but strongly curved downwards in others (e.g. the type of *B. macrophyllum*).

112. *Bulbophyllum gymnopus* Hook.f. – Fig. 2.

Bulbophyllum gymnopus Hook.f., Fl. Brit. Ind. 5 (1890) 764; id., Hooker's Icon. Pl. 21 (1892) t. 2040; Seidenf., Dansk Bot. Ark. 33, 3 (1979) 100. – *Phyllorchis gymnopus* (Hook.f.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 677. — *Drymoda gymnopus* (Hook.f.) Garay, Hamer & Siegerist, Nordic J. Bot. 14 (1994) 641; Seidenfaden, Opera Bot. 124 (1995) 47, **colour photograph pl. 9b**. — TYPE: Bhutan, Griffith 5133 (K, lecto., indicated by Seidenfaden, 1979); India, Khasia Hills, Griffith 5134 (K, W); India, Assam, Jowai, Clarke 42549 (K).

Figure 1. *Bulbophyllum penduliscapum* J.J. Sm. (111) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, above: single pair, below: two pairs. – All from Vermeulen 1147 (living plant).

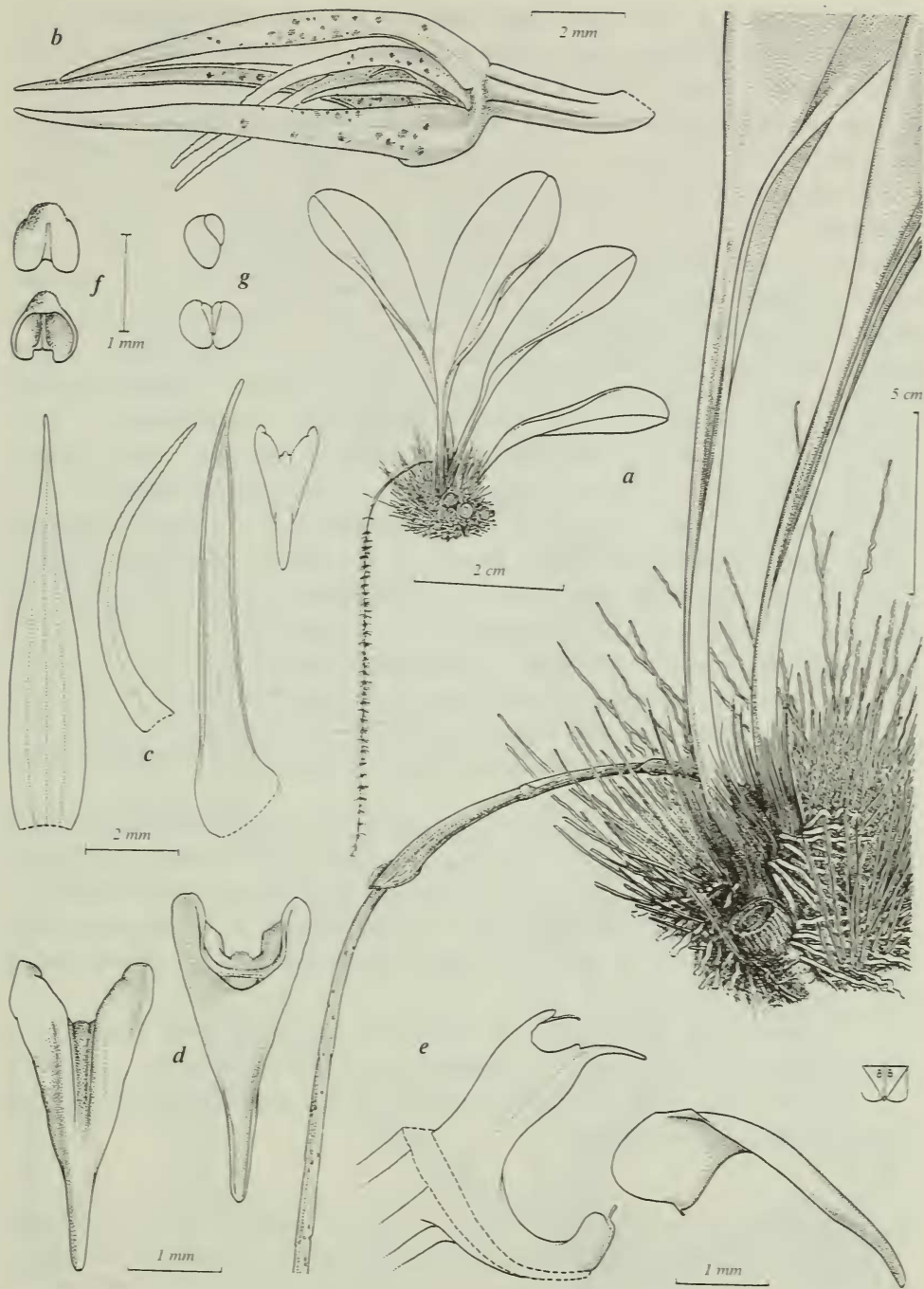


Figure 1. *Bulbophyllum penduliscapum* J.J. Sm. (111)

Rhizome 2.5—4.5 mm diam., sections between pseudobulbs 3—22 cm long; bracts, including veins, soon withering. *Pseudobulbs* distant, ovoid, 1.2—4 x 0.8—1.5 cm. *Petiole* 1.0—3.5 cm. *Leaf blade* elliptic, 4.8—17 x 1—3.2 cm, index (length/width) 4.3—6.3; obtuse. *Inflorescence* a lax raceme, erect to patent, 7—23 cm, 7—28-flowered. *Peduncle* 1.8—7 cm; bracts 4—6, the longest 5—17 mm long. *Rhachis* 5—17 cm. *Floral bracts* ovate to triangular, 1.8—3.5 x 1—1.8 mm, acute. *Flowers* resupinate. *Pedicel* and *ovary* 8—10 mm long, basal node on a 1—2 mm-long stump. *Median sepal* ovate to triangular, 4.5—7 x 1.4—2.2 mm, index 2.2—3.9; emarginate, rounded to acute, margins entire; glabrous, base narrowly attached; thin, surface glabrous or slightly papillose towards the tip abaxially. *Lateral sepals* falcate, 5—8 x 1.4—2.5 mm, index 3—4.3; obtuse, otherwise as the median sepal. *Petals* recurved, falcate, linear with a wide base, 3—5.5 x 0.4—0.7 mm, index 4.2—11; obtuse to acuminate, margins erose towards the tip; glabrous, base broadly attached; thin. *Lip* recurved slightly below half-way, linguiform, 2—4 x 0.8—1.3 mm, index 1.6—5; obtuse, margins entire, glabrous or finely papillose locally; thick, surface $\pm$ glabrous; adaxially concave near the base, often with 2 inconspicuous, obtuse ridges about half-way up the lip, space in between the two ridges somewhat channelled; abaxially with a distinct, deeply emarginate ridge up to about 1/3 of the length of the lip. *Column* 2—3 mm long, foot elongated so that a gap exists between the petals and the lateral sepals. *Stelidia* triangular, 0.4—1 mm long, acute, often with an inconspicuous, deltoid, obtuse tooth along the upper margin.

Colours: Rhizome scales in young shoots densely spotted with purplish brown. Sepals and petals white, pale greenish white or yellowish. Lip yellow or orange. Column white to orange. Flowers with an unpleasant smell.

Habitat & ecology: Epiphytic or lithophytic in evergreen forest (Seidenfaden, 1979), in montane forest. Alt. 600–2000 m. Flowering in Jan—Mar and Oct—Dec.

Distribution: BHUTAN (1 specimen seen), INDIA: Sikkim (1); Khasia Hills (1); Naga Hills (1); Assam (5). THAILAND (2).

Notes. The densely spotted scales of the young shoots are very characteristic in this species.

Figure 2. *Bulbophyllum gymnopus* Hook.f. (112) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, left: two pairs, right: single pair. – a. From King's collectors s.n. (herbarium specimen); b—e. From Seidenfaden & Smitinand GT 8643 (spirit sample); f. From Herb. Hooker f. s.n. (herbarium specimen); g. From Hort. Kew EN 596-68 (spirit sample).

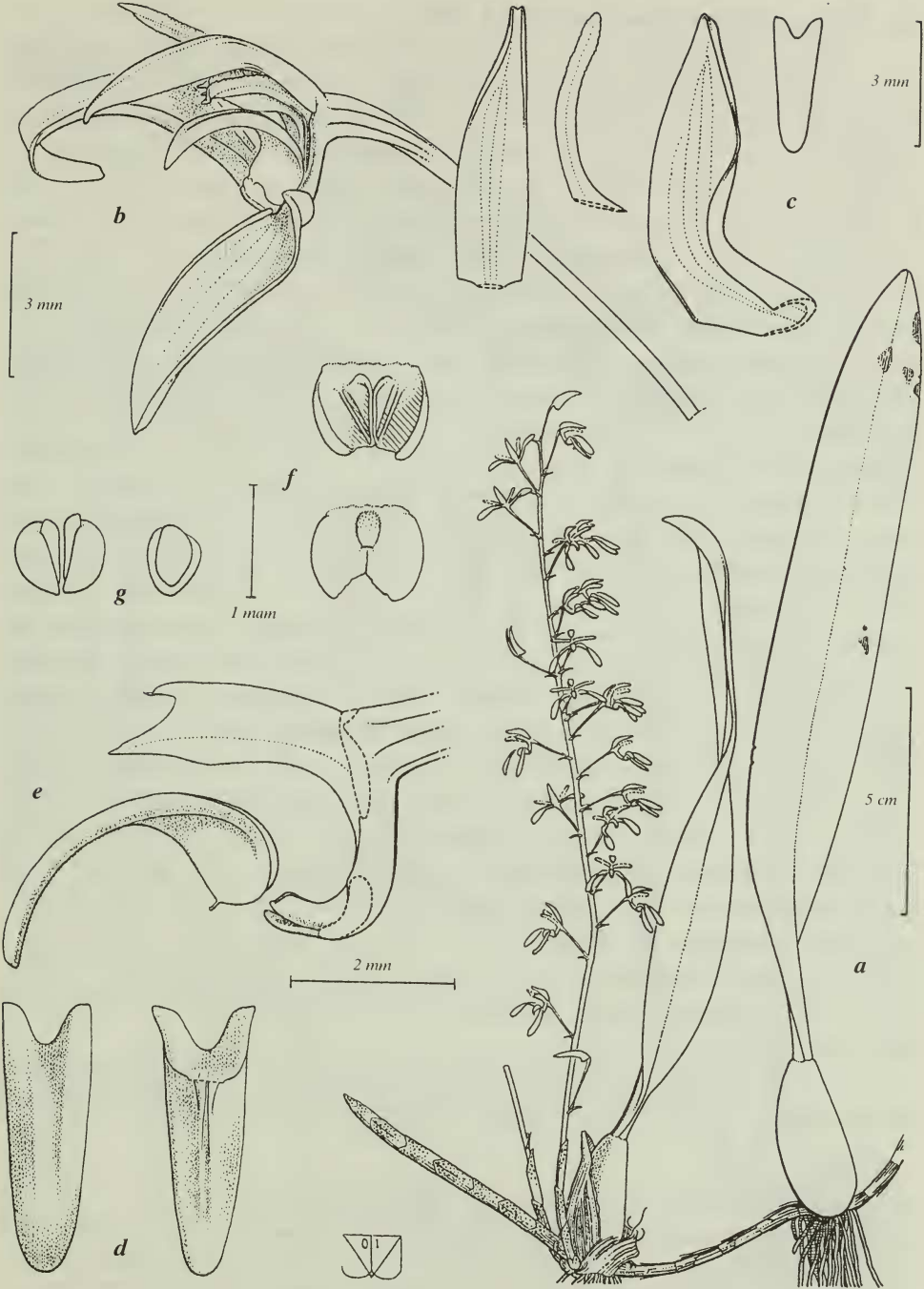


Figure 2. *Bulbophyllum gymnopus* Hook.f. (112)

113. *Bulbophyllum farinulentum* J.J. Sm.

Rhizome 4—8 mm diam., sections between pseudobulbs 1.2—5 cm long; bracts, including veins, soon withering. *Pseudobulbs* close to distant, ovoid, 0.8—2.2 x 0.8—2.2 cm. *Petiole* 2.5—18 cm. *Leaf blade* elliptic to obovate, 8.5—27 x 3—7.5 cm, index (length/width) 2.2—4.2; rounded to obtuse. *Inflorescence* a lax to dense raceme, erect to patent, 19—55 cm, 5—150-flowered. *Peduncle* 10—25 cm; bracts 5—6, the longest 18—40 mm long. *Rhachis* 3.5—22 cm. *Floral bracts* ovate to triangular, 6.8—12 x 1.5—2 mm, acute. *Flowers* not resupinate. *Pedicel* and *ovary* 4—15 mm long. *Median sepal* ovate to triangular, 9.5—19 x 2—3.2 mm, index 4.2—8.7; acute, margins entire, $\pm$ glabrous, base broadly attached; rather thin; adaxially finely papillose to pubescent except for the basal part. *Lateral sepals* 10—22 x 2.2—3.8 mm, index 3.9—8.8; otherwise as the median sepal. *Petals* recurved, tapering from a wide base, 6.5—13.5 x 0.9—1.6 mm, index 4—10.4; acute to acuminate, margins $\pm$ entire, papillose to ciliolate, base rather narrowly attached; thin, top somewhat thickened; adaxially finely papillose to pubescent except for the basal part. *Lip* recurved in the basal half, $\pm$ triangular, 2.8—4.6 x 1—1.7 mm, index 2.1—3; subacute, margins entire, finely papillose locally; thick; adaxially slightly concave near the base, with 3 ridges: 2 distinct, obtuse ridges proximally diverging and often protruding like two retrorse, conical, obtuse knobs and distally running parallel up to about 2/3—3/4 of the length of the lip, space in between the two ridges deeply channelled and proximally with an inconspicuous to rather distinct, rounded median ridge with longitudinal rows of minute papillae on its crest, adaxial surface otherwise finely papillose locally; abaxially with rather inconspicuous, retuse to truncate ridge up to about 1/2 of the length of the lip, surface glabrous. *Column* 2.3—3 mm long. *Stelidia* narrowly triangular to subulate, 0.8—1.2 mm long, acute, often with a small, antrorse, deltoid, obtuse to acute tooth along the upper margin; often with an inconspicuous, deltoid, obtuse to broadly rounded wing along the lower margin, at the base

Notes: The material allows two subspecies to be distinguished, mainly on account of the size of the vegetative parts and the number of flowers in

Figure 3. *Bulbophyllum farinulentum* J.J. Sm. ssp. *farinulentum* (113a) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: abaxial side, right: adaxial side; g. Pollinia, left: single pair, right: two pairs. — *Bulbophyllum farinulentum* J.J. Sm. ssp. *densissimum* (Carr) J.J. Verm. (113b) – h. Lip, left: adaxial side, right: abaxial side; i. Column and lip, lateral view. – a–e. From *Hort. Leiden* 20771; f, g. From *Hort. Leiden* 26544 (all spirit samples); h. From *Synge* 98 (herbarium specimen); i. From *Hort. Leiden* 914076 (spirit sample).



Figure 3: a—g. *Bulbophyllum farinulentum* J.J. Sm. ssp. *farinulentum* (113a);
h—i. *Bulbophyllum farinulentum* J.J. Sm. ssp. *densissimum* (Carr) J.J. Verm. (113b)

the inflorescence. Further collecting, however, may reveal intermediate forms.

Vermeulen (1991: 21) incorrectly regarded this as synonymous with *B. disjunctum*. The differences are given below the latter.

Key to the subspecies

1. Inflorescence 5—25-flowered. Flowers in a lax raceme a. **subsp. farinulentum**
1. Inflorescence 60—150-flowered. Flowers in a dense raceme b. **subsp. densissimum**

a. subsp. *farinulentum* – Fig. 3.

Bulbophyllum farinulentum J.J. Sm., Bull. Jard. Bot. Buitenzorg, s. 3, 2 (1920) 87. — TYPE: Indonesia, Sumatra, Kerinci, *Jacobson cult. 1413* (Leg. Groenenveldt) (BO, holo., not seen).

Bulbophyllum noeanum Kerr, Bull. Misc. Inform., Kew (1927) 219. – TYPE: Thailand, Pattani, *Kerr 0113* (K, holo.).

Bulbophyllum disjunctum sensu J.J. Verm., Orch. Borneo 2 (1991) 21 (pro parte), non Ames & C. Schweinf.

Rhizome 4—6 mm diam. *Pseudobulbs* 1—2.2 x 0.8—2.2 cm. *Petiole* 2.5—10 cm. *Leaf blade*, 8.5—20 x 3—6.5 cm. *Inflorescence* a lax raceme, 19—55 cm, 5—25-flowered. *Rhachis* 3.5—22 cm. *Pedicel* and *ovary* 10—15 mm long. *Lip* 3—4.6 x 1—1.7 mm, often with the ridges proximally protruding like two inconspicuous to distinct knobs. *Stelidia* narrowly triangular, 0.8—1.2 mm, with or without a wing along the lower margin, at the base.

Colours: Sepals and petals (pale) yellow to pale ochre, with red veins. Lip yellow, reddish brown in the centre, or in the apical half.

Habitat & ecology: Epiphyte growing in shaded places in *kerangas* forest in lowland and montane conditions. Alt. 400—2000 m. Flowering in Jan, Feb, May, Sep—Nov.

Distribution: THAILAND: Peninsula (1 specimen seen). MALAYSIA: Peninsula (3); Sarawak (1); Sabah (5). INDONESIA: Sumatra (*fide* J.J. Smith); Kalimantan (1).

b. subsp. *densissimum* (Carr) J.J. Verm., *stat. nov.* – Fig. 3, plate 2.

Bulbophyllum densissimum Carr, Gard. Bull. Straits Settlements. 8 (1935) 116. – TYPE: Malaysia, Sarawak, Dulit Range, *Synge 98* (K, holo.).

Bulbophyllum disjunctum sensu J.J. Verm., Orch. Borneo 2 (1991) 21 (pro parte), non Ames & C. Schweinf.

Rhizome 6—8 mm diam. *Pseudobulbs* 0.8—1.5 x 0.8—1.5 cm. *Petiole* 9—18 cm. *Leaf blade*, 17—27 x 6.5—7.5 cm. *Inflorescence* a dense raceme, 21—36 cm, 60—150-flowered. *Rhachis* 8—18 cm. *Pedicel* and *ovary* 4—8 mm long. *Lip* 2.8—3.2 x 0.9—1.1 mm, with the ridges proximally protruding like two distinct knobs. *Stelidia* subulate, c. 1.2 mm, $\pm$ without a wing along the lower margin.

Colours: Peduncle bracts yellowish green or red. Flowers entirely creamy yellow, slightly sweetly scented.

Habitat & ecology: Epiphyte in lowland (*kerangas*) forest and probably lower montane forest. Alt. 900 m. and probably higher. Flowering in Mar, Aug.

Distribution: MALAYSIA: Sarawak, Hose Mts. (3 specimens seen).

Notes. Forms of *B. disjunctum* with dense-flowered inflorescences, and occurring in the same area, may look similar but have acute leaves.

114. *Bulbophyllum fulvibulbum* J.J. Verm. — Fig. 4, plate 3.

Bulbophyllum fulvibulbum J.J. Verm., Orch. Borneo 2 (1991) 23. — TYPE: Malaysia, Sabah, Ulu Padas, Vermeulen 603 (L, holo.; K, iso.).

Rhizome 12—14 mm diam., sections between pseudobulbs 3—4 cm long; bracts, including veins, soon withering. *Pseudobulbs* distant, ovoid, 3—4 x 2.5—2.8 cm. *Petiole* 18—25 cm. *Leaf blade* elliptic to obovate, 37—40 x 8.5—10 cm, index (length/width) 4—4.4, obtuse. *Inflorescence* a rather lax raceme, erect to patent, 28—82 cm, 18—62-flowered. *Peduncle* 13—29 cm; bracts 5—6, the longest 25—50 mm long. *Rhachis* 12—53 cm. *Floral bracts* ovate, 6—15 x 2—3 mm, acute. *Flowers* not resupinate. *Pedicel* and *ovary* 14—25 mm long. *Median sepal* ovate, 10—14.3 x 3.4—5.3 mm, index 2—4.3; obtuse, margins entire, finely papillose or ciliolate towards the tip, base broadly attached; rather thick, top thickened; surface finely papillose towards the tip. *Lateral sepals* 12—17 x 4.5—5 mm, index 2.5—3.6; otherwise as the median sepal. *Petals* recurved, tapering from a wide base, 8—11 x 1.5—2.2 mm, index 4.2—5.4; obtuse, margins entire, finely ciliolate towards the tip, base broadly attached; thick, top thickened, surface adaxially very finely papillose towards the tip. *Lip* recurved slightly below half-way, linguiform, 3.5—4.6 x 1.8—2.5 mm, index 1.7—2.1; obtuse, margins entire, glabrous or finely papillose locally; thick; adaxially slightly concave near the base, with 3 ridges: 2 distinct, obtuse ridges proximally diverging and protruding backwards like two conical, obtuse horns and distally running parallel up to about 2/3 of the length of the lip, space in between the two ridges deeply channelled and with a distinct, narrow, obtuse often finely papillose median ridge with or without a thin median slit over its crest, adaxial surface otherwise glabrous but finely papillose towards the base;

abaxially with a distinct, truncate ridge up to about 1/3 of the length of the lip, surface glabrous. *Column* 3—5 mm long. *Stelidia* triangular, 0.5—1.3 mm long, acute, often with a small, antrorse, deltoid, obtuse to acute tooth along the upper margin.

Colours: Sepals yellow or greenish, adaxially with or without dark red spots, abaxially (sometimes also adaxially) with dark red flushing towards the base. Petals yellow or greenish. Lip yellow or greenish, suffused with dark red towards the base, or lip entirely dull red with a pale green tip. Flowers scentless.

Habitat & ecology: Found as an epiphyte in montane forest with *Agathis*, and in *kerangas* forest growing near the forest floor. Alt. 1100—1500 m. Flowering observed in Oct (Mar, Apr in greenhouse).

Distribution: MALAYSIA: Sarawak, Bario area (1 specimen seen); Sabah, Ulu Padas (3).

Notes: Close to the preceding species; differs in having flowers with wider parts. The median ridge on the adaxial side of the lip is always very distinct, whereas it is usually inconspicuous in *B. farinulentum*.

115. *Bulbophyllum nemorale* L.O. Williams — Fig. 5.

Bulbophyllum nemorale L.O. Williams, Bot. Mus. Leaf., Harvard University 9 (1938) 100. — TYPE: Philippines, Leyte, Jaro, Masaganap, Wenzel 871 (PNH, holo., destroyed; AMES, iso.).

Rhizome 5—8 mm diam., sections between pseudobulbs 2—5 cm long. *Pseudobulbs* close to distant, ovoid, 1—1.3 x 0.8—1.5 cm. *Petiole* 7.5—17 cm. *Leaf blade* elliptic, 15—35 x 4.5—10.5 cm, index (length/width) 2.8—5; acute to acuminate. *Inflorescence* a lax to rather dense raceme, erect to patent, 21—49 cm, 13—40-flowered. *Peduncle* 9—32 cm; bracts 6—8, the longest 20—48 mm long. *Rhachis* 9—19 cm. *Floral bracts* elliptic to ovate, 7—12 x 2—3.5 mm, acute to slightly acuminate. *Flowers* ± secund. *Pedicel* and *ovary* 7—11 mm long. *Median sepal* ovate to triangular, 13—17 x 2.4—4 mm, index 3.5—5.6; acute, margins entire; glabrous, base rather broadly attached; rather thin. *Lateral sepals* falcate, 13—15 x 4.2—5 mm, index 2.6—3.7, base broadly attached; otherwise as the median sepal. *Petals* porrect, falcate, basal half elliptic to obovate, top half linear, 11—14 x 1.5—3, index 4—7.3; acute, margins finely erose ± half-way; glabrous; base rather broadly attached; rather thin with a thickened top part; with 3 veins,

Figure 4. *Bulbophyllum fulvibulbum* J.J. Verm. (114) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: abaxial side, right: adaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, left two pairs, right: single pair. – All from Vermeulen 603 (living plant).

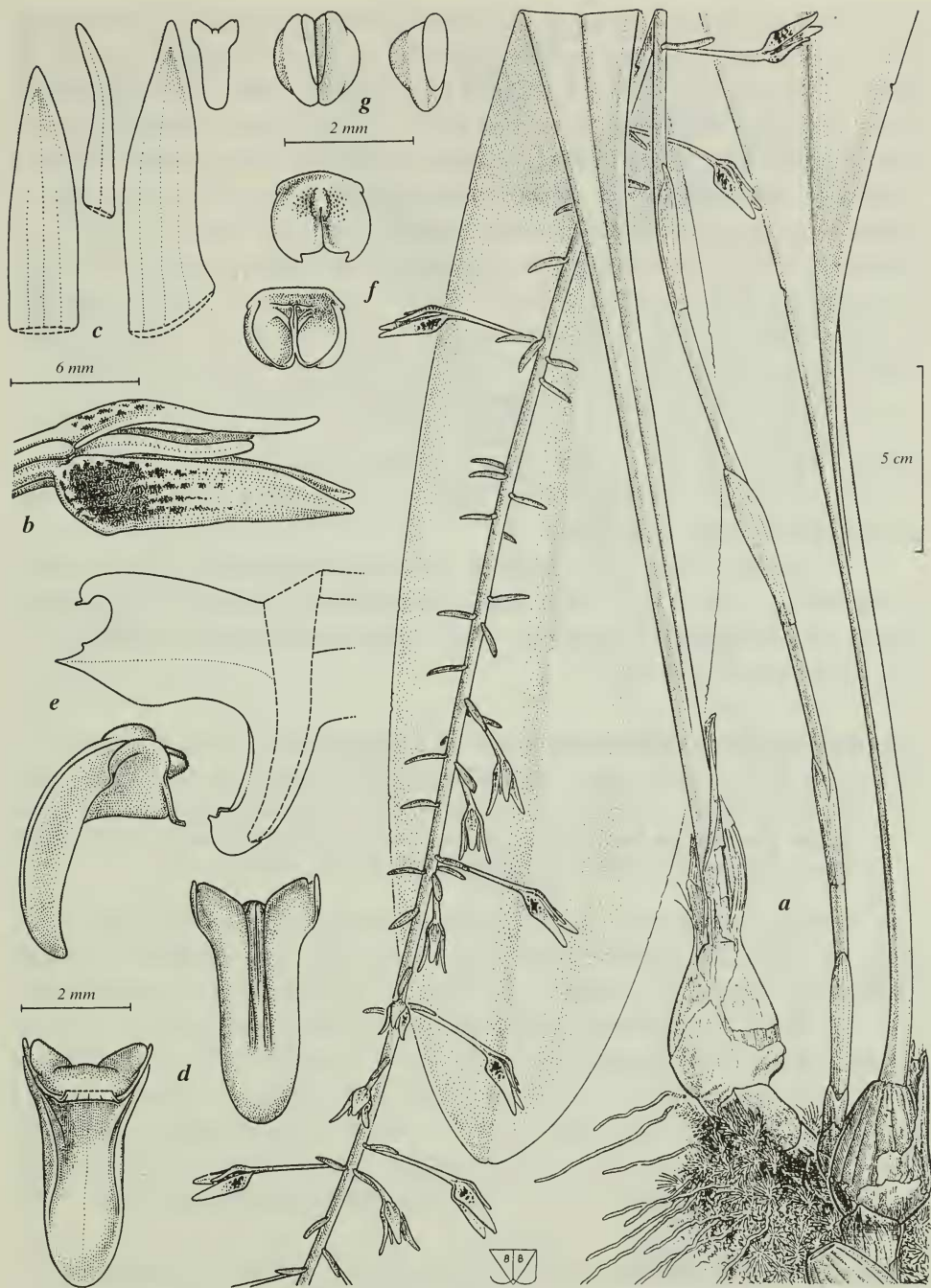


Figure 4. *Bulbophyllum fulvibulbum* J.J. Verm. (114)

the laterals sometimes incomplete and not reaching the base. *Lip* recurved in the basal half, margins entire; glabrous or finely papillose locally; 3-lobed; *midlobe* $\pm$ triangular, 4.2—4.8 x 2.2—3.8 mm, index 1.2—2.2; obtuse, rather thick; adaxially concave and with 2 knob-shaped ridges near the base, with 2 more distinct, obtuse ridges proximally diverging and running $\pm$ parallel from about 1/3 to 2/3 of the length of the lip, the space in between channelled; abaxially with a retuse ridge up to about 1/2—2/3 of the length of the lip; *lateral lobes* attached along the proximal third of the lip, retrorse, ovate to semi-circular, 1.4—1.5 mm high, rounded, margins incurved, thin. *Column* 3—5 mm long. *Stelidia* subulate, 0.8—2.2 mm long, acute, with an antrorse, deltoid, obtuse tooth along the upper margin.

Colours: flowers (pale) yellow with purple spots. Lip green.

Habitat & ecology: Forest, epiphytic or as a terrestrial. Alt. 700—1300 m. Flowering in Feb, May, fruiting in Feb, Apr.

Distribution: PHILIPPINES: Luzon (1 specimen seen); Leyte (4). INDONESIA: Irian Jaya (1).

Notes: The Irian Jaya specimen only has partly peloric flowers, with rudiments of pollinia below the disfigured stelidia. The flowers are slightly larger, and have slightly narrower parts than the Philippine material, but are otherwise quite similar.

116. *Bulbophyllum disjunctum* Ames & C. Schweinf. — Fig. 6, plate 4.

Bulbophyllum disjunctum Ames & C. Schweinf., Orch. 6 (1920) 176; J.J. Verm., Orch.

Borneo 2 (1991) 21 (pro parte, see also under *B. farinulentum* and its subspecies).

colour photograph 4a. TYPE: Malaysia, Sabah, Gunung Kinabalu, Marei Parei Spur, *Clemens* 254 (AMES. holo.; BM, BO, K, NY, SING. iso.).

Rhizome 5—10 mm diam., sections between pseudobulbs 3.5—8 cm long. *Pseudobulbs* distant, ovoid, 1—2 x 0.8—1.5 cm. *Petiole* 6—16 cm. *Leaf blade* elliptic to obovate, 13—28 x 3—6.5 cm, index (length/width) 2.9—7.4; acute to acuminate. *Inflorescence* a lax raceme, erect to patent, 19—62 cm, 10—40-flowered. *Peduncle* 10—23 cm; bracts 5—8, the longest 28—42 mm long. *Rhachis* 9—39 cm. *Floral bracts* elliptic to ovate, 9—20 x 1.8—4 mm, acute. *Pedicel* and *ovary* 5—12 mm long. *Median sepal* ovate-triangular, 10.5—23 x 1.8—3.5 mm, index (3—)6.1—7.3; long-caudate, margins entire or slightly erose-papillose, base broadly attached; rather

Figure 5. *Bulbophyllum nemorale* L.O Williams (115) – a. Habit; b. inflorescence; c. Flower; d. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; e. Lip, above: adaxial side, below: abaxial side; f. Column and lip, lateral view; g. Anther, above: adaxial side, below: abaxial side; h. Pollinia, left: single pair, right: two pairs. – a, c, d. From *Wenzel* 871; b, h. From *Kalkman & Tissing* 4187; e–g. From *Wenzel* 922 (all herbarium specimens).

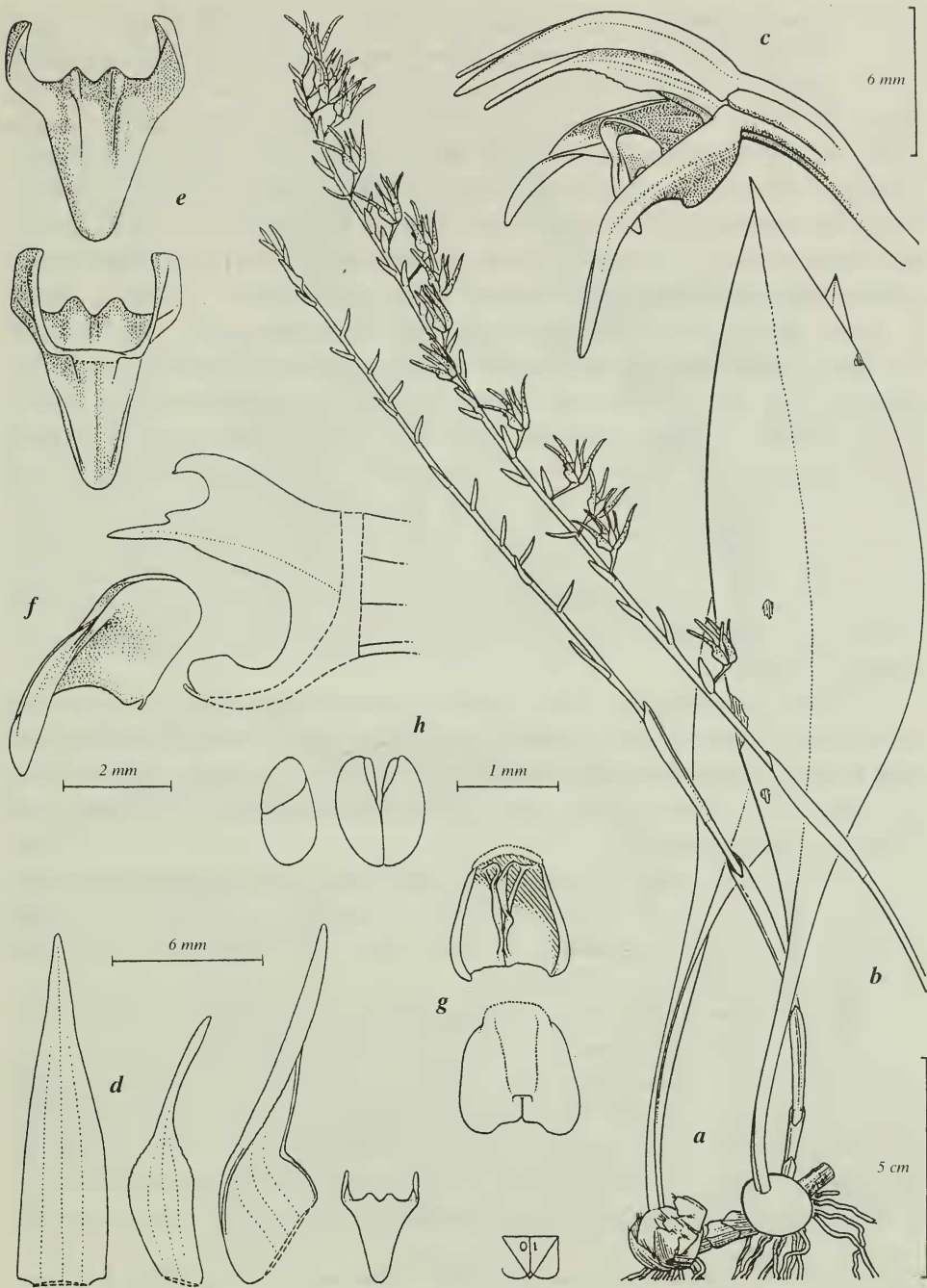


Figure 5. *Bulbophyllum nemorale* L.O Williams (115)

thin, surface glabrous, rarely slightly papillose adaxially. *Lateral sepals* (11.5—)16—32 x 2.5—4 mm, index (2.8—)6.4—8.3; otherwise as the median sepal. *Petals* recurved, tapering from a wide base, 7.5—16 x 1—2.5 mm, index (3—)7—9.4; acute, margins finely erose-denticulate, rarely almost entire, base rather broadly attached; thin, top somewhat thickened, surface glabrous, adaxially occasionally finely papillose towards the tip; with 1 vein. *Lip* recurved in the basal half, ovate to triangular, 3—6 x 1—2(—3) mm, index (1—)2—3; obtuse to acute, margins entire, finely papillose locally; rather thin; adaxially concave near the base, with 3 ridges: 2 distinct, obtuse to acute ridges proximally diverging and protruding like two erect to antrorse, conical, obtuse knobs and distally running parallel up 3/4 of the length of the lip or more, the space in between channelled and with a rather distinct, rounded median ridge with longitudinal rows of minute papillae proximally on its crest, adaxial surface otherwise glabrous or finely papillose locally; abaxially with rather inconspicuous, retuse to truncate ridge up to about 1/3 of the length of the lip, surface glabrous. *Column* 2.2—4 mm long. *Stelidia* $\pm$ subulate, 1—1.8 mm long, acute, with a small, antrorse, deltoid, obtuse to acute tooth along the upper margin; often with a rather inconspicuous, deltoid, obtuse to subacute wing along the lower margin, at the base.

Colours: Peduncle and floral bracts usually suffused with red, sometimes yellowish green. Pedicel and ovary pale green. Sepals and petals pale yellow or creamy white, usually with red dots partially aligned along the veins. Lip yellow with a paler base, with or without red markings. Flowers sweetly scented.

Habitat & ecology: Terrestrial or understorey epiphyte, often growing in moss, in montane forest. Also found in lowland *kerangas* forest. Alt. 500–3000 m. Flowering mainly in Mar, Apr, Oct—Dec, but incidental flowering recorded in most months.

Distribution: MALAYSIA: Sarawak (13 specimens seen); Sabah (22).

Notes: *Bulbophyllum farinulentum* differs from *B. disjunctum* in having rounded to obtuse leaf tips, adaxially papillose to pubescent sepals, papillose-ciliolate (rather than erose-denticulate) petals, and in lacking erect or antrorse knobs on the adaxial surface of the lip. The colours are also slightly different: *B. farinulentum* has sepals and petals with red veins, *B. disjunctum* has scattered red spots, more or less aligned along the veins.

Figure 6. *Bulbophyllum disjunctum* Ames & C. Schweinf. (116) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: abaxial side, right: adaxial side; e. Lip, left: adaxial side, right: lateral view; f. Column and lip, lateral view; g. Anther, above: abaxial side, below: adaxial side; h. Pollinia, left two pairs, right: single pair. – a. From Carr 3212; b—d, f—h. From De Vogel 8218; e. From Beaman 11128 (all herbarium specimens).

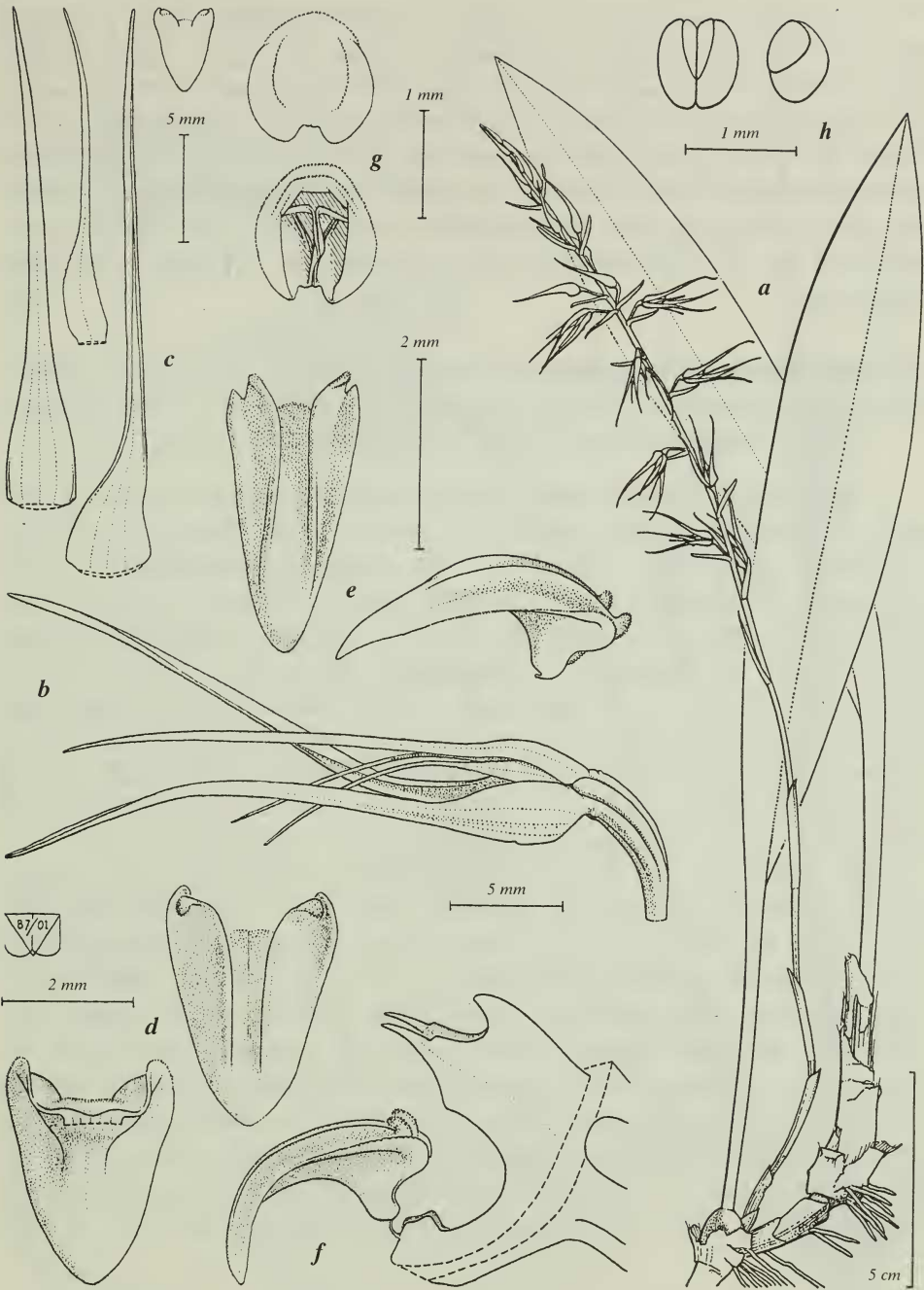


Figure 6. *Bulbophyllum disjunctum* Ames & C. Schweinf. (116)

Locally in Sarawak (*Hort. Leiden* 914075 & 980182, from the Hose Mts. and the Bario area respectively), a form with short, sturdy, rather dense inflorescences and relatively short and wide flower parts is found. The aberrant measurements are given between brackets in the description above. See plate 4, and compare with the normal form (Vermeulen 1991, colour photograph 4a; see above). The first specimen listed above also has the keels on the lip with inconspicuous knobs only. This form may be mistaken for *B. farinulentum* ssp. *densissimum*, but see below that subspecies.

117. *Bulbophyllum placochilum* J.J. Verm. — Fig. 7. (probably extinct)

Bulbophyllum placochilum J.J. Verm., Orch. Borneo 2 (1991) 29. — TYPE: Malaysia, Sabah, Gunung Kinabalu, *Clemens* 34056 (L, holo.; BM, NY, iso.).

Rhizome 5—10 mm diam., sections between pseudobulbs 4—11 cm long. *Pseudobulbs* distant, ovoid, 1—2 x 0.8—1 cm. *Petiole* 10—20 cm. *Leaf blade* elliptic, 23—38 x 4.5—11 cm, index (length/width) 3.2—5.1; acuminate. *Inflorescence* a dense raceme, erect to patent, 24—36 cm, 15—20-flowered. *Peduncle* 21—32 cm; bracts 7—9, the longest 30—42 mm long. *Rhachis* nodding near its base, slightly thickened, 3—4.5 cm. *Floral bracts* ovate, 8—10 x 2—3 mm, acute. *Pedicel* and *ovary* 6—10 mm long. *Median sepal* elliptic, 11—14 x 4—5.5 mm, index 2.5—2.6; rounded to obtuse, margins entire; glabrous, base broadly attached; rather thick. *Lateral sepals* slightly falcate, 10.5—14 x 4.5—4.8 mm, index 2.3—2.9; otherwise as the median sepal. *Petals* porrect, tapering from a wide base, 11—13 x 2—2.2 mm, index 5.5—5.9; obtuse, margins entire or minutely erose towards the tip; glabrous, base broadly attached; rather thin, somewhat thickened towards the tip; with 1 vein. *Lip* recurved near the base and reflexed near the tip, orbicular to transversely elliptic, 3—3.5 x 3.5—4 mm, index 0.7—1; acute, margins entire; glabrous, rather thin along the median line, thin elsewhere; adaxially slightly concave and with a central callus near the base, with 2 distinct, obtuse ridges without protruding knobs, diverging proximally and running from about 1/4 to 3/4 of the length of the lip, the space in between channelled; abaxially with a retuse ridge up to about 1/2 of the lip. *Column* 4.5—4.8 mm long. *Stelidia* somewhat falcate, triangular, 1.3—2 mm long, acute, with a broadly rounded wing along the lower margin, at the base.

Figure 7. *Bulbophyllum placochilum* J.J. Verm. (117) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side. – All from *Clemens* 34065 (herbarium specimen).

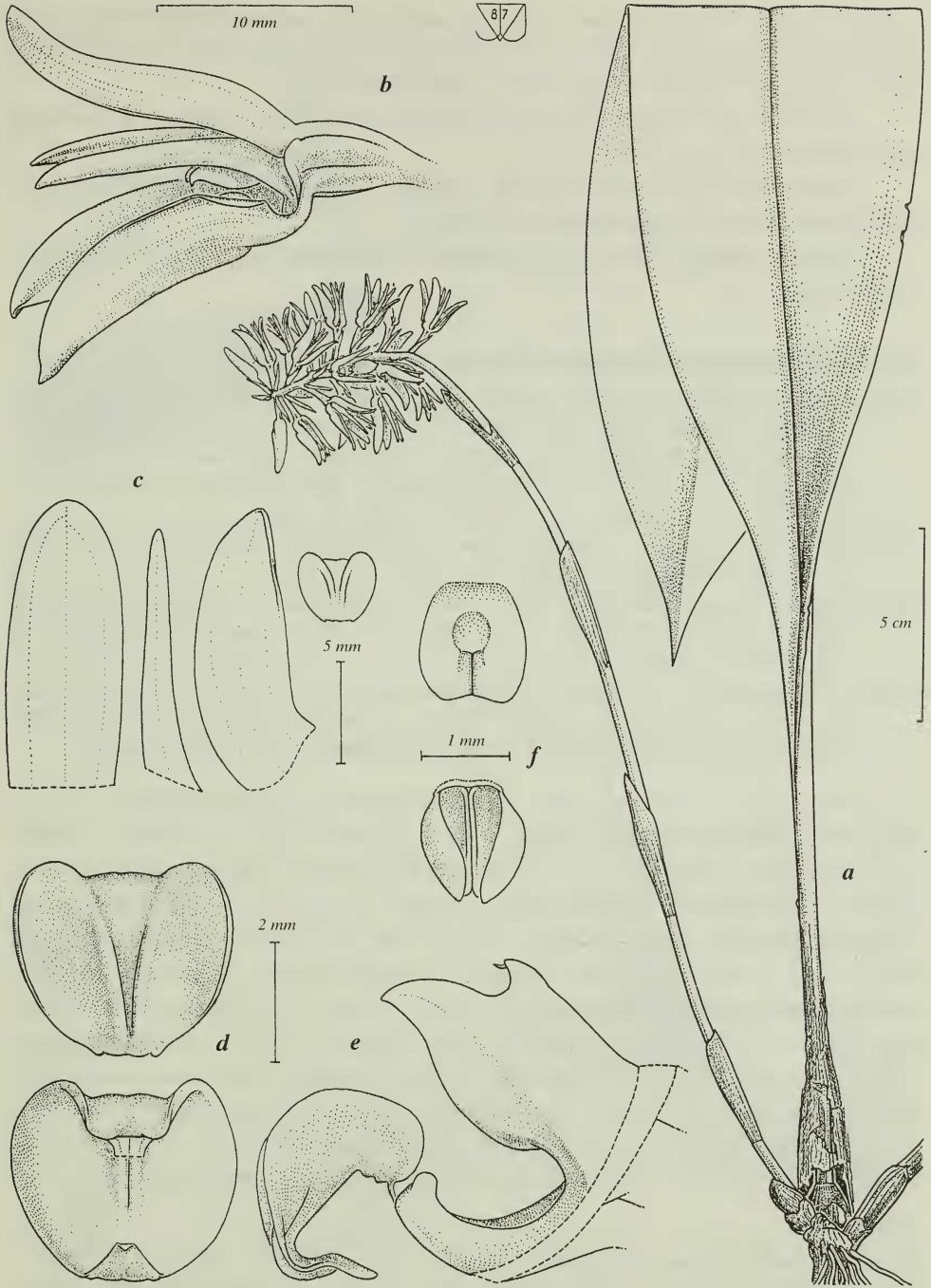


Figure 7. *Bulbophyllum placochilum* J.J. Verm. (117)

Colours: Flowers creamy yellow, sepals and petals minutely speckled pale purple in the top half; lip minutely speckled pale purple except for the top. Column white, front with two crimson streaks.

Habitat & ecology: Montane forest. Alt. 1500—1800 m. Flowering and fruiting in Jun—Aug.

Distribution: MALAYSIA: Sabah, Gunung Kinabalu only. (3 specimens seen). Not collected since 1933.

Notes. Without flowers, this could be mistaken for a small form of *B. elongatum*.

118. *Bulbophyllum elongatum* (Blume) Hassk. — Fig. 8.

Bulbophyllum elongatum (Blume) Hassk., Cat. Bogor. 2 (1844) 39. — *Ephippium elongatum* Blume, Bijdr. (1825) 309. — *Cirrhopetalum elongatum* (Blume) Lindl., Edward's Bot. Reg. 29 (1843) sub 49. — *Phyllorchis elongata* (Blume) Kuntze, Rev. Gen. Pl. 2 (1891) 677. — TYPE: Indonesia, Java, Gunung Salak, *Blume* 195 (L, lecto.), 287 (L, syn.), *s.n.* LHB 902,322-934 (L, syn.).

Bulbophyllum gigas Ridl., J. Linn. Soc., Bot. 32 (1896) 277. — TYPE: Malaysia, Perak, Maxwell's Hill, *Ridley* (1893) (SING, holo.).

Bulbophyllum sceptrum Rchb.f., Walp. Ann. 6 (1861) 254. — *Phyllorchis sceptrum* (Rchb.f.) Kuntze, Rev. Gen. Pl. 2 (1891) 678. — TYPE: Indonesia, 'Sundaic' Is. (W, holo., not seen).

[Not *B. elongatum sensu* F. Kraenzl., Bot. Jahrb. Syst. 34 (1905) 248; J.J. Sm., Repert. Spec. Nov. Regni Veg. 32 (1932) 310. — Specimen: *Beccari PS 10239* (FI, similar to the nominal taxon *B. korinchense* Ridl., sect. *Aphanobulbon*).]

Rhizome 5—13 mm diam., sections between pseudobulbs 3—17 cm long. **Pseudobulbs** distant, ovoid, 0.8—1.6 x 0.6—1.5 cm. **Petiole** 5.5—22 cm. **Leaf blade** elliptic, 20—50 x 6—16 cm, index (length/width) 3.1—3.9; acute to acuminate. **Inflorescence** a dense raceme, with the flowers in irregular whorls, erect to patent, 24—65 cm, 30—100-flowered. **Peduncle** 14—53 cm; bracts 7—8, the longest 25—80 mm long. **Rhachis** 3—12 cm, nodding near its base. **Floral bracts** ovate, 7—13 x 1.5—4 mm, acute. **Pedicel** and **ovary** 5—6 mm long. **Median sepal** elliptic, 12.5—17.5 x 3.8—4 mm, index 3.3—4.6; obtuse to acuminate, margins entire; glabrous, base rather narrowly attached; rather thin. **Lateral sepals** somewhat falcate, 12—16 x 3.5—4.5 mm, index 3.2—4; acute to acuminate, otherwise as the median sepal. **Petals** porrect, falcate, linear, tapering from a wide base, 10.5—15 x

Figure 8. *Bulbophyllum elongatum* (Blume) Hassk. (118) — a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Lip, adaxial side; f. Column and lip, lateral view; g. Anther, above: adaxial side, below: abaxial side; h. Pollinia, above: two pairs, below: single pair. — a—d, f—h. From *Hort. Leiden 26216* (spirit sample); e. From *Sands 5285* (herbarium specimen).



Figure 8. *Bulbophyllum elongatum* (Blume) Hassk. (118)

1.2—1.8 mm, index 7.2—10; obtuse to acute, margins entire; glabrous, base broadly attached; thin, top thickened; with 1 vein. *Lip* reflexed in the basal half, triangular with a projecting, linguiform top, 2.7—3.3 x 2.4—3 mm, index 1—1.2; rounded, margins entire; glabrous, rather thin, top thick; adaxially flat near the base, with 3 ridges without protruding knobs: 2 weak, rounded ridges, most conspicuous distally, the space in between channelled and with a inconspicuous, rounded median ridge with longitudinal rows of minute papillae on its crest proximally; abaxially with rather inconspicuous, truncate ridge up to about 1/2 of the length of the lip. *Column* 4.4—5 mm long. *Stelidia* narrowly triangular, 1.5—2.2 mm long, acute, with a small, antrorse, deltoid, obtuse to acute tooth along the upper margin; with an often inconspicuous, deltoid, obtuse tooth along the lower margin, at the base.

Colours: Sepals and petals white with purple spots. Lip yellow with fine red dots.

Habitat & ecology: Epiphyte in damp forest, near streams; also found as a terrestrial, creeping over the forest floor. Alt. 300—2000 m. Flowering in Jan—Mar, Aug—Dec.

Distribution: MALAYSIA: Peninsula (7 specimens seen); Sarawak (1); Sabah (1). BRUNEI (1). PHILIPPINES: Luzon (1); Negros (1); Leyte (2). INDONESIA: Sumatra (1); Java (4); Irian Jaya (1). PAPUA NEW GUINEA (2).

Notes: Plants from the Philippines are relatively small.

119. *Bulbophyllum lissoglossum* J.J. Verm. — Fig. 9.

Bulbophyllum lissoglossum J.J. Verm., Orch. Borneo 2 (1991) 25, **colour photograph pl. 4b**; J.J. Wood *et al.*, Plants of Mt. Kinabalu 2 (1993) 111, **colour photograph pl. 14b**. — TYPE: Malaysia, Sabah, Gunung Kinabalu, Vermeulen & Chan 390 (L, holo.; K, iso.).

Rhizome 4—6 mm diam., sections between pseudobulbs 1—3 cm long. *Pseudobulbs* close to distant, ovoid, 1.8—3 x 1—2.5 cm. *Petiole* 4—15 cm. *Leaf blade* elliptic, 15—27 x 2.1—4.5 cm, index (length/width) 3.8—8.5; acute to slightly acuminate. *Inflorescence* a rather dense raceme, erect to patent, 26—40 cm, 22—45-flowered. *Peduncle* 12—27 cm; bracts 6—7, the longest 18—32 mm long. *Rhachis* erect or arching, 8—16 cm. *Floral bracts* elliptic to ovate, 5.5—8 x 1.5—2 mm, acute. *Pedicel* and *ovary* 9—10

Figure 9. *Bulbophyllum lissoglossum* J.J. Verm. (119) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, left: two pairs, right: single pair. – All from Vermeulen & Chan 390 (living plant).

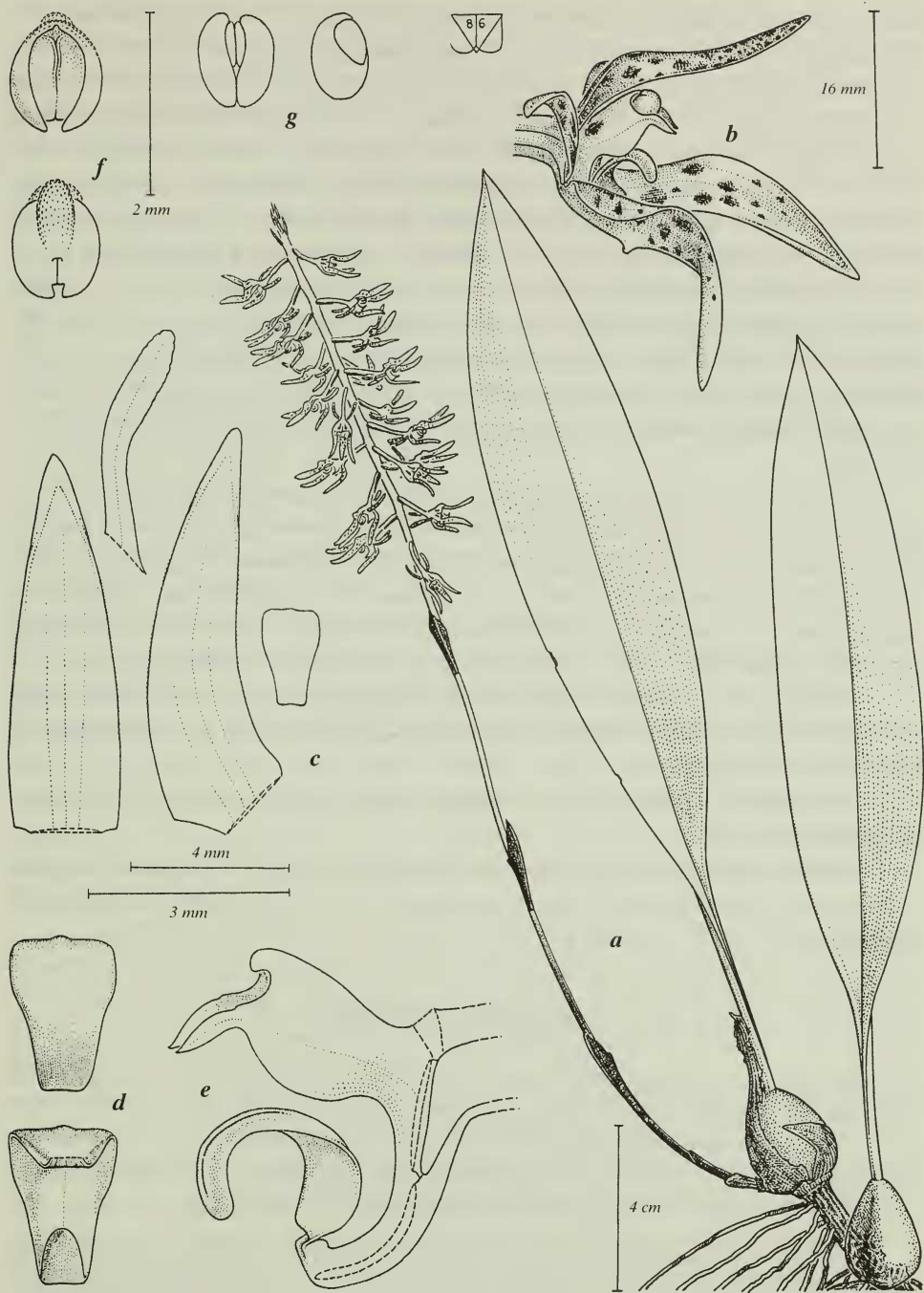


Figure 9. *Bulbophyllum lissoglossum* J.J. Verm. (119)

mm long. *Median sepal* ovate to triangular, 8—11.2 x 2—3 mm, index 3.2—4.5; subacute, margins entire, finely papillose locally, base rather broadly attached; rather thick, top thickened, surface glabrous. *Lateral sepals* somewhat falcate, 9—12 x 2—3 mm, index 3.3—4.5; otherwise as the median sepal. *Petals* porrect, falcate, linear, 5.5—6.5 x 0.8—1 mm, index 5.2—6.5; obtuse, margins slightly erose towards the tip; glabrous, base broadly attached; rather thin, thickened towards the tip; with 1 vein. *Lip* reflexed half-way, $\pm$ triangular, 2—3.5 x 1—1.8 mm (without spreading), index 1.5—2.4; obtuse, margins entire; glabrous; rather thick; adaxially without ridges, surface $\pm$ flat; abaxially with a weak, rounded ridge up to about 1/3 of the length of the lip. *Column* 2.5—3.5 mm long. *Stelidia* falcate linear, 1—1.5 mm long, acute, with a small, antrorse, deltoid, obtuse to acute tooth along the upper margin; with a broadly rounded wing along the lower margin, at the base.

Colours: Inflorescence purple or green, suffused with purple. Bracts pale green, spotted purple. Pedicel and ovary yellowish with some purple spots. Sepals white, slightly greenish at the base, the median spotted purple, the laterals only so in the basal half. Petals as the median sepal. Lip green, median part yellowish, top part suffused with purple but extreme tip bright green. Column white with a few purple spots. Flowers without smell.

Habitat & ecology: Understorey epiphyte, or terrestrial in moss cushions. Montane (*kerangas*) forest. Alt. 1000—1900 m. Flowering in May—Jul, Nov, Dec.

Distribution: MALAYSIA: Sabah, Gunung Kinabalu to Ulu Padas (8 specimens seen).

Notes: The Sarawak record in Vermeulen (1991: 25) is based on the erroneous identification of the specimen SAR (*Chai*) 33968, which is *B. disjunctum*.

Section *Hirtula* Ridl.

Bulbophyllum sect. *Hirtula* Ridl., Mat. Fl. Mal. Penins. 1 (1908) 68; J.J. Verm., Orch. Borneo 2 (1991) 231; Garay *et al.*, Nordic J. Bot. 14 (1994) 628. — LECTOTYPE (see Vermeulen, 1991: 231): *Bulbophyllum hirtulum* Ridl.

Bulbophyllum sect. *Barbula* J.J. Sm., Repert. Spec. Nov. Regni Veg. 32 (1932) 328. — TYPE: *Bulbophyllum trichoglottis* Ridl. (= *B. hirtulum* Ridl.).

Rhizome creeping. *Roots* predominantly sprouting below the pseudobulbs. *Pseudobulbs* 1-leafed, usually not or hardly laterally flattened, sometimes moderately flattened (*penicillium*, *ochthodes*), wrinkling with age in a random pattern. *Inflorescence* with many flowers, rarely 1-flowered (sometimes in *rariflorum*). *Rhachis* either not swollen when compared to

the peduncle, or swollen into a spindle-shaped, cylindrical, or bilaterally flattened body tapering towards both ends, with an inconspicuous to distinct depression below each flower. *Floral bracts* recurved to reflexed. *Flowers* usually spirally arranged (but [partly] distichous in *tremulum*, *xenosum* and *secundum*; partly in incomplete whorls in *polycyclum*), not resupinate, or resupinate (*secundum*), one to many open simultaneously. *Pedicel* and *ovary*: basal node either more or less flush with the surface of the rhachis, or on a stump up to 2 mm high. *Median sepal*: margins glabrous to distinctly ciliate; 1—3-veined. *Lateral sepals* free, margins glabrous to distinctly ciliate, the upper often with longer cilia than the lower; 1—5-veined. *Petals* $\pm$ porrect, margins entire or slightly erose, sparsely (*cerebelum*) to distinctly ciliate, rarely papillose (*phreatiopse*); 1-veined. *Lip*: margins entire, usually with 1-celled cilia, hairs or spindle-shaped appendages, rarely sparsely ciliate (*cerebellum*, *limbatum*, *rariflorum*) or glabrous (*phreatiopse*); rather thin to thick, often fleshy, at the base usually with two small, sometimes inconspicuous (*lindleyanum*, *phreatiopse*, *parviflorum*), retrorse, semi-elliptic to triangular, obtuse auricles flanking the ligament. *Column*: stigma often protruding or with distinct teeth at its base, column foot sometimes somewhat thickened but otherwise without accessories. *Stelidia* often distinct, triangular to linear, often subulate, often with teeth along the upper and lower margins that may be so large that they together form an oblong structure from which only the tip of the stelidia protrude. *Anther* abaxially usually with a papillose to hairy ridge near its base; frontal part not or hardly projecting, front margin usually long ciliate, less often papillose, rarely $\pm$ glabrous (*parviflorum*). *Pollinia* 4; the inner $\pm$ half as long as the outer or longer, flattened on both sides; the outer flattened on one side. Stipes absent.

Distribution. China (3 species), Nepal (2), Bhutan (2), India (4 species, of which 1 is endemic), Myanmar (3), Thailand (8, 1 endemic), Vietnam (5, 2 endemic), Peninsular Malaysia (5, 2 endemic), Sumatra (7, 1 endemic), Java (1 endemic), Borneo (19, 14 endemic), Sulawesi (1 endemic), Philippines (4 endemic), New Guinea (1 endemic).

The use of the term 'lip margin'. Towards the tip of the lip, the margins may only be visible as a very thin flange or even a thin line, usually with hairs implanted. In several species with a very thick lip this line does not follow the full extension of the lip; but traverses the lip over the adaxial or abaxial surface. The opposite surfaces are then described as 'distinctly convex'. In several species a median ridge on the adaxial side overtops the distinctly convex adaxial surface.

Delimitation of the section. Sect. *Hirtula* includes a suite of species with usually rather 'hairy' flowers. The petals and/or the lip are indeed ciliate or otherwise set with 1-celled hairs in all species, although only

sparingly so in some. Moreover, a series of species (*B. eublepharum* Rchb.f., *B. insulsoides* Seidenf., *B. levinei* Schltr, and *B. scabratum* Rchb.f.), seemingly constitute a grading of the section into racemose species with a less 'hairy' aspect. An extended character set is necessary to delimitate sect. *Hirtula*:

- a. Pseudobulbs wrinkling in a random pattern with age. Occurs in all species of sect. *Hirtula*. It also occurs elsewhere, but not in the species listed above with *B. eublepharum*; these all have pseudobulbs wrinkling along pre-determined longitudinal lines.
- b. Inflorescence racemose. Occurs in all species of sect. *Hirtula*, although in *B. rariflorum* the inflorescence may abort after producing a single flower.
- c. Petals ciliate with 1-celled hairs. Occurs in all species, although *B. cerebellum* has only sparsely ciliate petals, and *B. phreatiopse* has papillose rather than ciliate petals. Elsewhere, ciliate petals are found in *B. eublepharum*, but this character is rarely found among SE Asian racemose *Bulbophyllum*. Species in and around sect. *Cirrhopetalum* all have fimbriate petals (with many-celled hairs).
- d. Lip with long hairs. Occurs in most species, although *B. cerebellum*, *B. hirtulum*, *B. limbatum*, and *B. rariflorum*, have only sparsely hairy lips, and *B. phreatiopse* has a glabrous lip. A long-haired lip is a rare character in other SE Asian racemose *Bulbophyllum* (present in, for instance, *B. refractum* Rchb.f. from Java).
- e. Two small auricles at the base of the lip, one on each side of the ligament connecting the lip to the column foot. These occur in all species, but are inconspicuous in *B. hirtulum*, *B. lindleyanum*, *B. phreatiopse*, and *B. parviflorum*. This character is unique within SE Asian racemose *Bulbophyllum*, although it occurs in some sections with 1-flowered species, for instance in a series of New Guinean species of sect. *Polyblepharon*.

If a polythetic set of a., b., and e. is chosen as diagnostic, this allows the exclusion of the species listed with *B. eublepharum* above, because these lack two out of the three characters.

Bulbophyllum phreatiopse displays two out of the three diagnostic characters, but its petals have papillose rather than ciliate margins, and the lip is glabrous. It does not fit well in sect. *Hirtula*, and has been included with doubt.

Bulbophyllum hastiferum Schltr, *B. pubiflorum* Schltr, *B. crassissimum* J.J. Sm., and *B. uvaeflorum* O'Byrne have shortly ciliate petals. Because the lateral sepals form a disc or spoon-shaped structure below the lip, these are better included in sect. *Osyricera*. O'Byrne originally included *Bulbophyllum uvaeflorum* in sect. *Hirtula*.

Several other similar-looking SE Asian species do not display the character set mentioned and are therefore excluded. *Bulbophyllum inconspicuum* Maxim. has fimbriate petals with many-celled hairs; *B. dayanum* Rchb.f. and similar species have ciliate petals, as well as two lateral lobes near the base of the lip. These lateral lobes, however, are attached in a much more distal position and are therefore not considered to be homologous with the auricles in sect. *Hirtula*.

Bulbophyllum vanum J.J. Verm. from Africa, as well as several Madagascar species included in the sections *Micromonanthe*, *Panthoblepharon*, and *Trichopus*, have ciliate petals, or a ciliate lip, or both. After analysing several species (*B. microglossum* Perr., *B. muscicolum* Schltr., *B. nigriflorum* Perr., and *B. pleurothallopsis* Schltr), I assume that none have auricles similar to the ones in sect. *Hirtula*.

Monophyly. The diagnostic set of characters is sufficiently sturdy to assume monophyly *a-priori*, possibly after exclusion of *Bulbophyllum phreatiopse*. For an outgroup, the first choice would be the series mentioned above with *B. eublepharum*.

Taxonomic views on sect. Hirtula. Ridley lists four taxa under his sect. *Hirtula*: *B. tenerum* Ridl. [a species close to *B. planibulbe* (Ridl.) Ridl.], *B. hirtulum* Ridl., *B. cincinnatum* Ridl. (is *B. hirtulum*), and *B. limbatum* Lindl. His section includes species with 'hairy' flowers (except for the probably erroneously included *B. tenerum*), with an elongated or subumbellate inflorescence. This general idea was retained in Vermeulen (1991). Garay *et al.* (1994: 628) state that only *Bulbophyllum carinilabium* and *B. hirtulum* (with some of its synonyms listed as separate taxa) can be included because of the chosen lectotype species of sect. *Hirtula*. They do not offer any further explanation, and I can only assume that the presence of a subumbellate inflorescence, present in both species, has been given priority over other characters in the delimitation of sect. *Hirtula*. The subumbellate *B. gemmareginae* and *B. cerebellum*, however, show that several flower morphologies found in the series with an elongated inflorescence are repeated in the series with a subumbellate inflorescence. I prefer a wider circumscription of sect. *Hirtula*, as proposed here, because it is more likely to result in a monophyletic group (see above).

Species delimitation. Many species of sect. *Hirtula* appear rare in existing collections; they are represented by only a few samples, or even by a single one. This puts a limit to the reliability of this revision, because a proper delimitation of the species was difficult and infraspecific variability could not be assessed with the material now available. So far, only *Bulbophyllum hirtulum* displays variability exceeding the average. Some species pairs have been found that could well be sister species: *B. lasioglossum*–*B. negrosianum*, and *B. jolandae*–*B. comberipictum*. The three

species *B. aithorhachis*–*B. sororculum*–*B. setuliferum* are rather similar and may be closely related. Their status may need revision once more material of all three becomes available, although the moderately rich material now available of *B. setuliferum* displays no signs of grading into any of the others. All taxa assumed to be part of a group of sister species have been given specific rank, *ad hoc* considerations as to the phylogeny of the group have not entered the taxonomy of the revision.

Cultivation. About 25 species have recently been in cultivation. Most are plants from the understorey of primary tropical forests, and have been grown successfully under conditions usually recommended for *Bulbophyllum*: a substratum that never dries out entirely, semi-shade, high air humidity and good air movement. A fair number of plants have been lost because of bacterial rot, turning the victims from green to brown within a few days. Proper ventilation or even a permanent, rather strong airflow over the plants seems to prevent this to a certain extent. It appears that several species found at medium altitudes do well in lowland conditions as long as shading and a continuous airflow keep the plants cool, although they are, of course, best grown at a temperature similar to that in their natural habitat. Species with long rhizomes, like *B. limbatum* and *B. rariflorum*, grow well on thin slabs of fern root, a tree fern trunk or an upright wooden support. Most other species prefer some soft organic matter among their roots, either planted on a slab or in a pot. Flowering is often irregular, and years may pass before plants decide that it is time to please their owner. On the whole, most species are interesting rather than spectacular, although *B. gemmareginae* and *B. xenosum* are striking plants with flowers of delicate colours and shapes.

Key to Species of *Bulbophyllum* sect. *Hirtula*

1. Inflorescence subumbellate (rhachis half as long as the width of the inflorescence, or shorter); *or* inflorescence with 1 flower, and pseudobulbs touching
 2. Lateral sepals reflexed; upper margin long ciliate 120. **B. gemma-reginae**
 2. Lateral sepals somewhat recurved; upper margin glabrous to finely papillose or ciliolate
 3. Lip distally with mobile c. 2 mm long, flat appendages along the margins 121. **B. carinilabium**
 3. Lip distally ciliate, without flat appendages
 4. Lateral sepals acute to acuminate. Lip without lateral lobes (next to inconspicuous basal auricles) 122. **B. hirtulum**

4. Lateral sepals rounded. Lip with lateral lobes attached along the proximal third of its length..... 123. **B. cerebellum**
1. Inflorescence an elongated raceme; *or* inflorescence with 1 flower, and at least some pseudobulbs widely distant
5. Rhachis spindle shaped, or otherwise swollen when compared to the peduncle: (in some species difficult to see in herbarium material)
6. Petal index (length /width) 0.6—1.6; petals reniform, (transversely) elliptic to ovate
7. Lip ovate-subtriangular, distally rather thin and tapering towards a subacute tip
8. Pseudobulbs discoid. Lip ovate in the proximal third, then abruptly narrowed and drawn out into a slender, tapering top part. Lip margins only with long, thin, wavy hairs 124. **B. clipeibulbum**
8. Pseudobulbs ovoid. Lip ovate-subtriangular, gradually tapering towards the tip. Lip margins with stiff hairs, some of these slightly swollen distally 125. **B. penicillium**
7. Lip subspathulate, obovate, elliptic, or oblong, distally very thick and with a truncate to rounded tip (tip defined by the line along which the marginal hairs are inserted, excluding crests if present)
9. Median ridge on the adaxial side of the lip protruding beyond the tip of the lip as a high crest
10. Inflorescence $\pm$ erect, or with the peduncle patent, and the rhachis (slightly) nodding. Lip distally glabrous on the adaxial side (hairs implanted along the margins may cover adaxial surface)
11. Rhachis, pedicel and ovary without blackish dots. Petal index (length/width) 0.6—0.7. Lip concave near the tip (a depression present on both sides of the median ridge) 126. **B. setuliferum**
11. Rhachis, pedicel and ovary with minute blackish dots. Petal index 1.2—1.6. Lip not concave near the tip 127. **B. sororculum**
10. Inflorescence entirely pendulous. Lip distally irregularly hirsute on the adaxial side..... 128. **B. aithorhachis**
9. Median ridge on the adaxial side of the lip merging with the lateral ridges well before the tip of the lip, not protruding beyond the tip of the lip
12. Pedicel and ovary with minute blackish dots. Rhachis c. 5 mm thick. Longest hairs on lip straight, slightly club-shaped 129. **B. echinophilum**

12. Pedicel and ovary without blackish dots. Rhachis c. 1.5 mm thick. Longest hairs on lip wavy, thin 130. **B. lanuginosum**
6. Petal index more than 1.6, or petals hastate
 13. Lip abruptly narrowed at c. 1/3 of its length, then drawn out into a slender, tapering top part. Lip without a median ridge towards the tip 124. **B. clipeibulbum**
 13. Lip rounded at the tip; or lip with a median ridge overtopping the rounded front
 14. Column foot with an obtuse, papillose spur protruding from between the base of the lateral sepals 155. **B. deprincatiae**
 14. Column foot without a spur between the lateral sepals
 15. Petal tips acute
 16. Rhachis with the top 2—7 cm with only minute, sterile bracts and no flowers 131. **B. atratum**
 16. Rhachis with flowers to the very tip
 17. Whole inflorescence pendulous. Rhachis 2—3 mm thick 132. **B. groeneveldtii**
 17. Peduncle erect or patent, rhachis nodding. Rhachis 6—7 mm thick 133. **B. grotianum**
 15. Petal tips rounded to obtuse
 18. Rhachis distinctly flattened, the top 3—3.5 cm with only minute, sterile bracts and no flowers
 19. Sepals abaxially with scattered coarse papillae. Lateral sepals ovate, subacute. Lip adaxially finely hirsute 134. **B. janus**
 19. Sepals abaxially glabrous. Lateral sepals triangular, acuminate. Lip adaxially glabrous except for the finely papillose top part 135. **B. xiphion**
 18. Rhachis $\pm$ circular in section, with flowers to the very tip
 20. Flowers dimorphic: flowers along the basal part of the rhachis not much opening, with the lip 1.8—2.3 mm long; flowers along the top part opening wide, with the lip c. 4.2 mm long (flowers at the very tip of the rhachis smaller and with a smaller lip) 136. **B. mirabile**
 20. Flowers all of $\pm$ the same shape

- 21. Lip adaxially with a distinct, narrow median ridge embedded in a furrow over the distal 2/3 of the lip, and overtopping its tip as a high crest 127. **B. sororculum**
- 21. Lip adaxially flat or convex towards the tip, but without median ridge
 - 22. Lip adaxially papillose. Pseudobulbs distant 137. **B. spadiciflorum**
 - 22. Lip adaxially glabrous or irregularly wrinkled. Pseudobulbs touching
 - 23. Rhachis 1—1.8 cm long; flowers in a very dense raceme. Lip with lateral lobes attached along the proximal third of its length 123. **B. cerebellum**
 - 23. Rhachis 33—36 cm long, flowers in a rather lax raceme. Lip without lateral lobes (next to basal auricles flanking the ligament) 138. **B. polycyclum**
- 5. Rhachis about as thick as the peduncle
 - 24. Sepals adaxially partly or entirely pubescent or pilose
 - 25. Rhachis, pedicel, ovary, and abaxial surface of sepals densely hispid with short, stiff hairs 139. **B. lindleyanum**
 - 25. Rhachis, pedicel, ovary and abaxial surface of sepals glabrous
 - 26. Lip abaxially with numerous spindle-shaped hairs arising from tiny pits 140. **B. tremulum**
 - 26. Lip abaxially glabrous, pubescent or velutinous
 - 27. Lip pouch-shaped, deeply concave on the adaxial side 141. **B. scaphiforme**
 - 27. Lip only somewhat concave near the base on the adaxial side
 - 28. Lip 2.8—4.2 x 1—1.6 mm, abaxial surface convex towards the tip. Column 1—1.3 mm long 142. **B. nigripetalum**
 - 28. Lip 5—7 x 2—3.3 mm, abaxial surface $\pm$ flat to concave towards the tip. Column 1.4—1.8 mm long 143. **B. nigrescens**
 - 24. Sepals adaxially glabrous to finely papillose (margins often ciliate)
 - 29. Petal index (length/width) 3—4.6
 - 30. Lip 1.7—3 mm long (without stretching)
 - 31. Sepals abaxially hirsute. Lip adaxially with a circular depression near the tip 144. **B. trulliferum**
 - 31. Sepals abaxially glabrous. Lip adaxially convex near the tip

- 32. Rhizome sections between pseudobulbs 0.5—1.8 cm long 154. **B. secundum**
- 32. Rhizome sections between pseudobulbs 2—10 cm long 153. **B. parviflorum**
- 30. Lip 4—7.5 mm long
 - 33. Anthesis starting at the base of the rhachis. Median sepal triangular, tapering towards the tip or caudate, margins glabrous or finely papillose
 - 34. Pedicel and ovary 48—50 mm long. Median sepal c. 18.5 mm long. Lip margin with the longest hairs $\pm$ straight 145. **B. jolandae**
 - 34. Pedicel and ovary 8—20 mm long. Median sepal c. 7 mm long. Lip with the longest hairs distinctly wavy, woolly 146. **B. comberipictum**
 - 33. Anthesis starting at the top of the rhachis. Median sepal elliptic, acute to shortly acuminate, margins ciliate
 - 35. Lip adaxially with a median ridge continuing over c. 1/3 of the lip. Pedicel and ovary 7.5—14 mm long. Median sepal 6.5—9 mm long.. 147. **B. lasioglossum**
 - 35. Lip adaxially with median ridge continuing over c. 3/4 of the lip. Pedicel and ovary 5.5—6.5 mm long. Median sepal 5.5—5.8 mm long 148. **B. negrosianum**
- 29. Petal index less than 3
 - 36. Lip adaxially with 2—4 rows of distinct warts (calli) stretching over most of its length
 - 37. Pseudobulbs touching. Lip with slightly club-shaped hairs. Stelidia with a strap-shaped to somewhat spatulate tooth with a 2—3-furcate tip along the lower margin, near the base 149. **B. dracunculus**
 - 37. Pseudobulbs distant. Lip without club-shaped hairs. Stelidia with a deltoid to triangular, obtuse or acute tooth along the lower margin, near the tip
 - 38. Lip 6—6.8 mm long, adaxially with 4 rows of irregularly shaped calli 150. **B. polygaliflorum**
 - 38. Lip c. 3.1 mm long, adaxially with 2 rows of irregularly shaped calli 151. **B. ochthodes**
 - 36. Lip adaxially without calli, or with a single callus near its base

39. Lip adaxially near the base with a triangular callus
 40. Rhizome sections between pseudobulbs 4—19 cm long. Margins of lip glabrous.... 152. **B. phreatiopse**
 40. Rhizome sections between pseudobulbs 0.5—1.8 cm long. Margins of lip ciliate 154. **B. secundum**
39. Lip adaxially near the base without a callus
 41. Lip 1.7—3 mm long (without stretching)
 42. Rhizome sections between pseudobulbs 2—10 cm long 153. **B. parviflorum**
 42. Rhizome sections between pseudobulbs 0.5—1.8 cm long 154. **B. secundum**
 41. Lip 3.5—7.5 mm long
 43. Lip margins with long hairs
 44. Lip margins glabrous half-way. Petals triangular-ovate 155. **B. deprincatiae**
 44. Lip margins with hairs from base to tip. Petals obovate
 45. Median sepal index (length/width) 2.3—2.4, margins with long hairs 156. **B. pilosum**
 45. Median sepal index 7—8, margins ciliate 157. **B. xenosum**
 43. Lip margins papillose-ciliolate
 46. Floral bracts triangular, not clasping the rhachis. Inflorescence with many flowers open simultaneously 158. **B. limbatum**
 46. Floral bracts tubular, clasping the rhachis. Inflorescence with a single flower open only; each flower developing only after anthesis of the previous one 159. **B. rariflorum**

120. *Bulbophyllum gemma-reginae* J.J. Verm. – Fig. 10, plate 5.

Bulbophyllum gemma-reginae J.J. Verm., Blumea 41 (1996) 21. — TYPE: Malaysia, Sabah, Ulu Padas, *Jongejan cult.* 1856 (L, holo.).

Rhizome c. 1.3 mm diam., sections between pseudobulbs 0.2–0.7 cm long. *Pseudobulbs* touching, ovoid to $\pm$ globose, 0.5–1.2 x 0.3–0.7 cm. *Petiole* 0.3–0.4 cm. *Leaf blade* elliptic, 5–6.7 x 1.5–3.3 cm, index (length/width) 1.9–4.1; subacute. *Inflorescence* a subumbellate raceme, patent to $\pm$ pendulous, c. 3 cm, 7–10-flowered. *Peduncle* c. 2.7 cm; bracts c. 6, the longest c. 3 mm long. *Rhachis* porrect or arching, spindle-shaped, c. 0.3 x 0.12 cm. *Floral bracts* triangular, 0.8–1.2 x 0.6–0.8 mm, acute to shortly acuminate. *Flowers* opening wide, many simultaneously. *Pedicel* and *ovary* 7.5–10 mm long, basal node on a c. 0.5 mm-long stump. *Median sepal* reflexed, triangular, c. 5.8 x 1.9 mm, index c. 3; acute, margins long ciliate, base broadly attached; thin, surface glabrous. *Lateral sepals* ovate, c. 6.3 x 2.7 mm, index c. 2.3; subacute, otherwise as the median sepal. *Petals* porrect, ovate, c. 4.3 x 1.2 mm, index c. 3.6; acuminate, margins ciliate, base rather broadly attached; thin, surface shortly pubescent towards the tip. *Lip* abruptly recurved near the base, spatulate, c. 5 x 1.4 mm, index c. 3.6; rounded, margins ciliate with the cilia longest c. half-way up the lip; thick, surface $\pm$ glabrous; adaxially slightly concave and with two calli near the base, with a median slit up to c. 1/3 of the lip, with two distinct, obtuse ridges proximally diverging and distally continuing parallel and close together over 2/3–3/4 of the lip, with the distal half slightly concave; abaxially with a distinct, rounded ridge near the base, elsewhere $\pm$ flat. *Column* c. 1.1 mm long, stigma protruding at its base, column foot with two longitudinal, deltoid, rounded lamellae. *Stelidia* falcate, c. 0.8 mm long, acute, $\pm$ rectangular in outline with a large, antrorse, triangular, acute tooth along both margins. *Anther*: front margin ciliate, abaxial ridge $\pm$ glabrous.

Colours: Sepals creamy yellow, suffused with pale reddish brown towards the tip. Petals creamy yellow, with almost black lines bordering the midvein and the margins. Lip white, ridges on adaxial side greyish with minute white specks, top part with greyish black margins, hairs yellowish. Column yellow, foot with reddish purple spots.

Habitat & ecology: Understorey epiphyte in lower montane forest. Alt. c. 1100 m.

Figure 10. *Bulbophyllum gemma-reginae* J.J. Verm. (120) – a. Habit; b. Flower, including rhachis; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, left: single pair, right: two pairs. — All from *Jongejan cult.* 1856 (spirit sample).

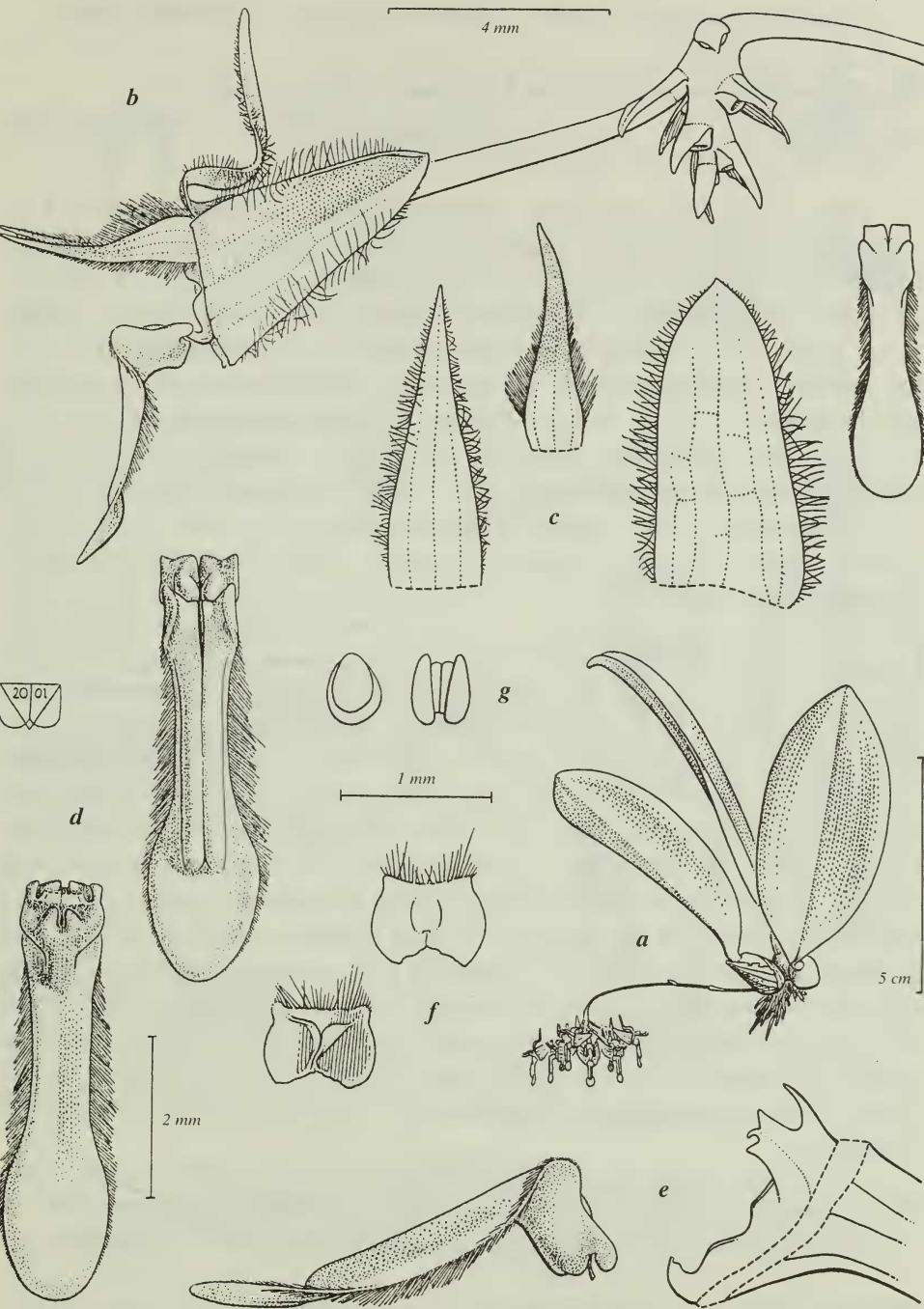


Figure 10. *Bulbophyllum gemma-reginae* J.J. Verm. (120)

Distribution: MALAYSIA: Sabah, Ulu Padas (1 specimen seen).

121. *Bulbophyllum carinilabium* J.J. Verm. – Fig. 11, plate 6.

Bulbophyllum carinilabium J.J. Verm., Orch. Borneo 2 (1991) 233. — TYPE: Malaysia, Sabah, Ulu Padas, *Vermeulen 641a* (L, holo.; K, iso.).

Rhizome 2.5—4 mm diam., sections between pseudobulbs 0.4—1 cm long. *Pseudobulbs* (almost) touching, ovoid to $\pm$ globose, 0.8—1.8 x 0.5—1.2 cm. *Petiole* 0.3—2.3 cm. *Leaf blade* elliptic to ovate, 5.5—15 x 2.5—5 cm, index (length/width) 2—5.4; acute. *Inflorescence* a subumbellate raceme, 4—16.4 cm, 4—11-flowered. *Peduncle* patent to $\pm$ pendulous, 3.7—15.7 cm, bracts 3, the longest 3.5—6 mm long. *Rhachis* porrect or arching, spindle-shaped, 0.3—0.7 x 0.1—0.18 cm. *Floral bracts* triangular, 1—1.3 x 0.6—0.8 mm, subacute. *Flowers* not much opening, few to many simultaneously. *Pedicel* and *ovary* 3.5—5 mm long, basal node almost flush with the surface of the rhachis. *Median sepal* porrect, ovate, 7—9 x 1.5—2.8 mm, index 2.8—6; (sub)acute, margins ciliate, base rather broadly attached; thin, surface glabrous. *Lateral sepals* somewhat recurved, 7—10 x 2—3 mm, index 2.3—5; obtuse to acute, margins glabrous; rather thin, otherwise as the median sepal. *Petals* porrect, triangular, 2—2.2 x 1—1.3 mm, index 1.6—2; (sub)acute, margins ciliate, base broadly attached; thin, surface glabrous. *Lip* $\pm$ straight but with a deep transverse fold near the base, elliptic to ovate with a narrow claw, 4.8—5.7 x 1.5—2.8 mm, index 1.9—3.8; rounded to obtuse, margins ciliate but with mobile, c. 2 mm long, linear, flat appendages near the tip; thick; adaxially concave near the base, with a narrow median ridge in the proximal 1/3, with two distinct calli clasping its distal end, with the distal 2/3 flat or slightly concave but with a small callus near the tip, with the surface glabrous except for a scabrous median strip over the distal 2/3; abaxially with a weak, rounded ridge over the distal three-quarters, surface glabrous. *Column* 1.6—2 mm long, column foot with two longitudinal, subtriangular lamellae clasping the median ridge on the adaxial side of the lip. *Stelidia* semi-elliptic, 0.7—1 mm long, rounded. *Anther*: front margin densely papillose with elongate papillae, abaxial ridge $\pm$ glabrous.

Colours: Sepals purple, base whitish or yellow with purple veins. Petals purple. Lip dark purple, sometimes yellowish green towards the base; the cilia white, the appendages near the tip purple or yellowish with

Figure 11. *Bulbophyllum carinilabium* J.J. Verm. (121) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: abaxial side, right: adaxial side; g. Pollinia, above: two pairs, below: single pair. – All from *Vermeulen 641a* (living plant).

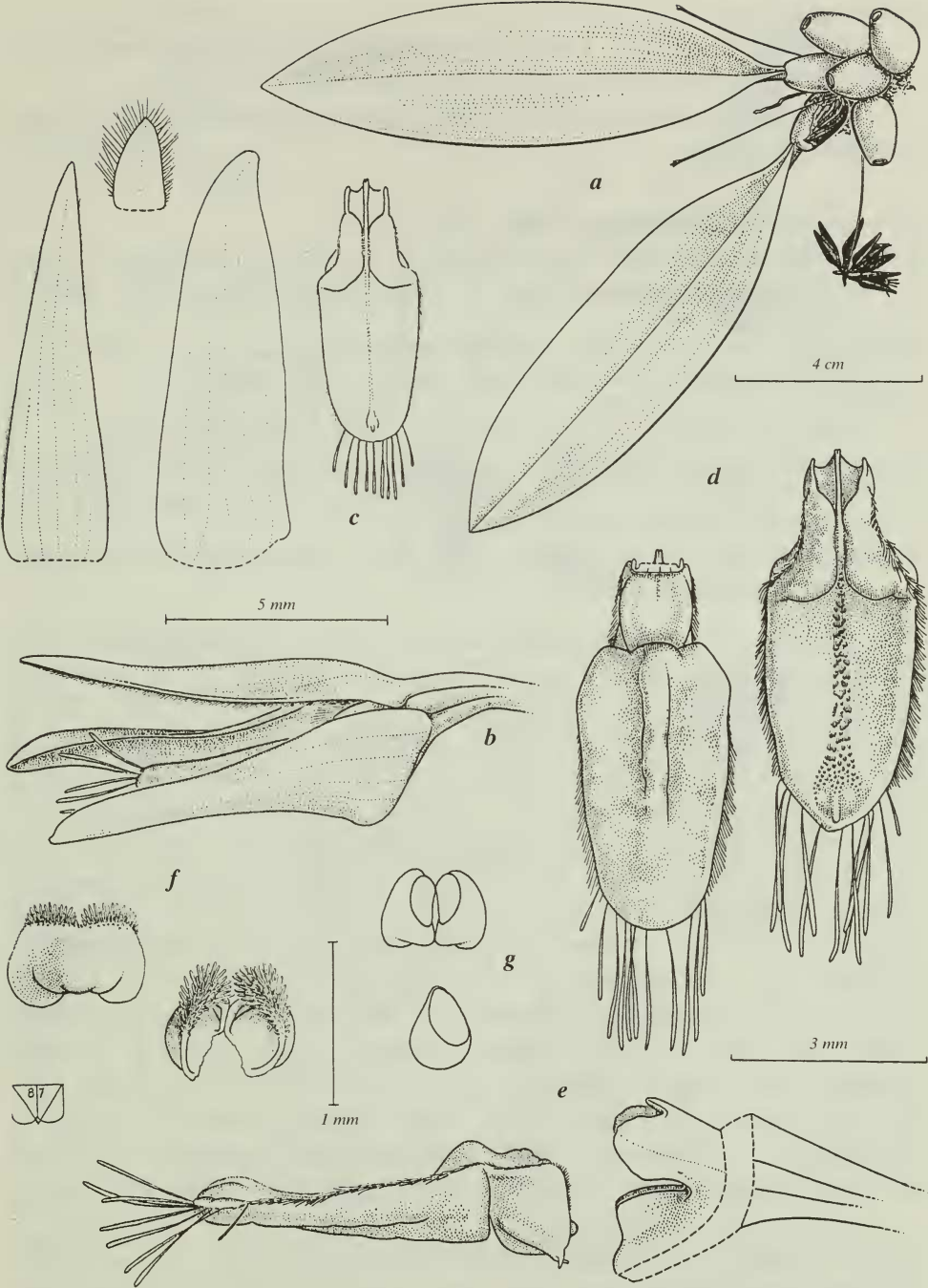


Figure 11. *Bulbophyllum carinilabium* J.J. Verm. (121)

purple margins.

Habitat & ecology: Understorey epiphyte in montane forest. Alt. 1500—3600 m. Flowering in Mar—May, Oct.

Distribution: MALAYSIA: Sabah, Gunung Kinabalu to Ulu Padas (5 specimens seen).

122. *Bulbophyllum hirtulum* Ridl. – Fig. 12.

Bulbophyllum hirtulum Ridl., J. Bot. 38 (1900) 71, J.J. Verm., Orch. Borneo 2 (1991) 237, **colour photograph pl. 16e**. — TYPE: Malaysia, Penang Hill, *Ridley & Curtis s.n.* (K holo.).

Bulbophyllum cincinnatum Ridl., J. Straits Branch Roy. Asiat. Soc. 39 (1903) 75. — TYPE: Malaysia, Perak, Batu Tujoh, *Ahmad s.n.* (K, holo.).

Bulbophyllum trichoglottis Ridl., J. Fed. Malay States Mus. 4 (1909) 66. — TYPE: Malaysia, Pahang, Telom, *Hort. Singapore (Ridley) 1909* (SING, holo.).

Bulbophyllum trichoglottis Ridl. var. *sumatranum* J.J. Sm., Bull. Jard. Bot. Buitenzorg, s. 3, 2 (1920) 98. — TYPE: Indonesia, Sumatra, Barisan Range, *Ajoeb (Exp. Jacobson) 807* (BO, holo.; K, L, SING, iso.).

Bulbophyllum salaccense sensu Beaman, T.E., et al., Orch. Sarawak (2001) **colour photograph pl. 7c**, non Rechb.f.

Rhizome 1.2—2.5 mm diam., sections between pseudobulbs 0.15—0.7 cm long. *Pseudobulbs* touching, ovoid to $\pm$ globose, 0.2—1 x 0.2—0.7 cm. *Petiole* 0.3—2.2 cm. *Leaf blade* elliptic to obovate, 2.2—17 x 0.7—6 cm, index (length/width) 2—3.5; obtuse to acute. *Inflorescence* hidden below the leaves, a subumbellate raceme, 4.5—10 cm, (1—)2—14-flowered. *Peduncle* patent to $\pm$ pendulous, 4.3—9.5 cm, bracts 4—5, the longest 3—7 mm long. *Rhachis* porrect or arching, spindle-shaped, 0.3—0.7 x 0.1—0.18 cm. *Floral bracts* triangular, 1—1.3 x 0.6—0.8 mm, subacute. *Flowers* not much opening, many simultaneously. *Pedicel* and *ovary* 2—4 mm long, basal node on a 0.2—0.5 mm-long stump. *Median sepal* porrect, sometimes reflexed, ovate to triangular, 4.5—6.5 x 1.8—3.3 mm, index 1.4—2.5; acute to acuminate, margins finely papillose to ciliolate; base broadly attached; rather thin, adaxial surface glabrous, abaxial surface glabrous or finely papillose. *Lateral sepals* somewhat recurved, 4—6 x 2.5—5 mm, index 1.1—2.2; otherwise as the median sepal. *Petals* porrect, ovate, 2—4 x 0.7—2 mm, index 2.1—3.6; obtuse to acute, margins ciliate, base broadly attached; thin, surface glabrous or adaxially slightly papillose towards the tip. *Lip*

Figure 12. *Bulbophyllum hirtulum* Ridl. (122) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f, g, h. Lip, adaxial side; i, j, k. Column, lateral view; l. Anther, left: adaxial side, right: abaxial side; m. Pollinia, left: single pair, right: two pairs. – a—e, l, m. From *TOC cult. 1203* (living plant); f, i. From *Carr s.n.*; g, j. From *Chan s.n.*; h, k. From *Lewis 291* (all spirit samples).

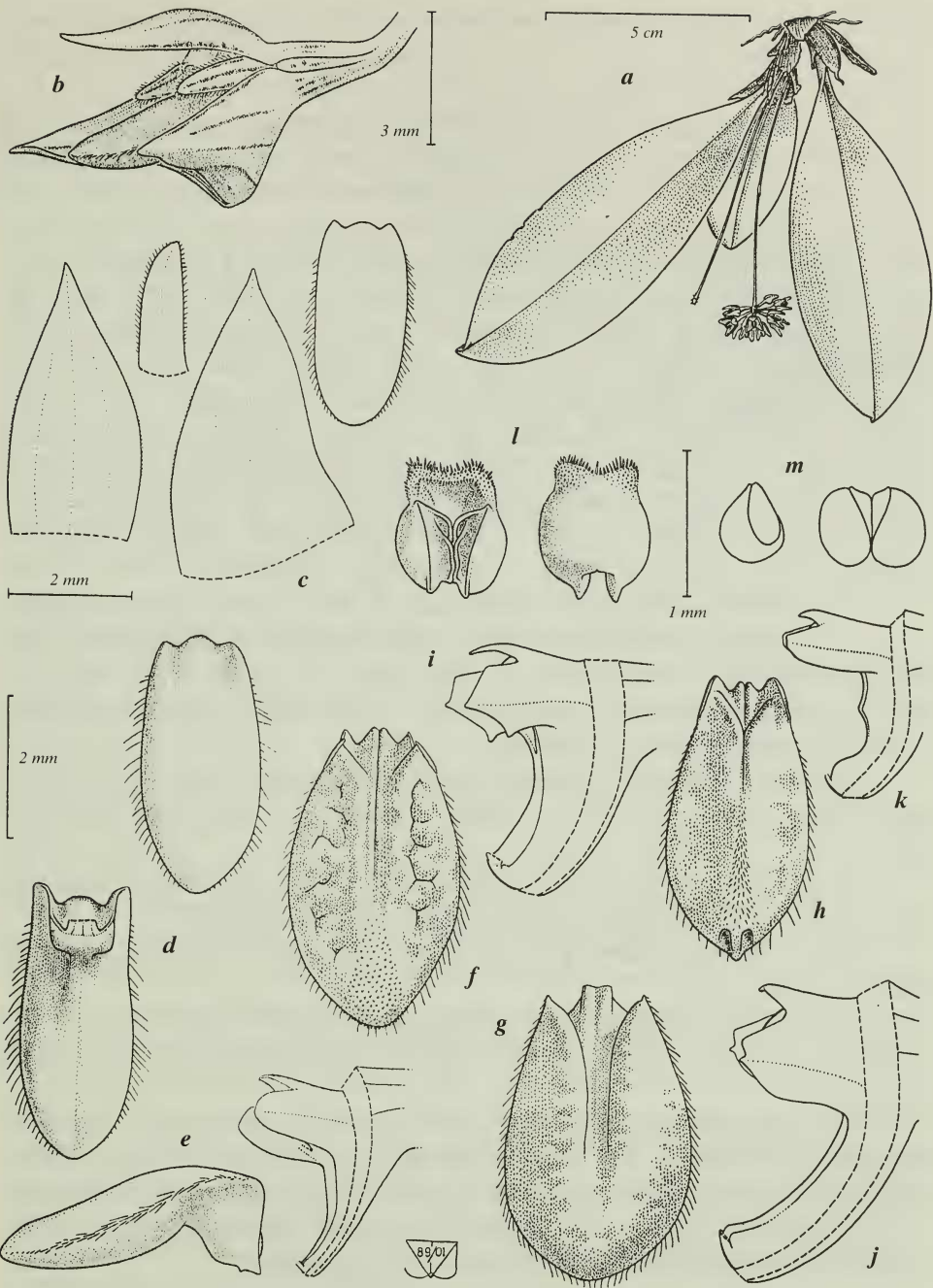


Figure 12. *Bulbophyllum hirtulum* Ridl. (122)

without lateral lobes, abruptly recurved in the proximal half or half-way, elliptic to obovate, 2.6—4 x 1.5—2.8 mm, index 1.3—2.6; rounded, sometimes apiculate, margins ciliate; thick; adaxially (slightly) concave and with 1—2 calli near the base, with or without a median slit up to c. 1/2 of the lip, with two inconspicuous to distinct, proximally diverging, obtuse ridges, with the surface distally convex, with or without two tiny pits close to the tip, with the surface smooth to coarsely, often transversely wrinkled, often finely papillose all over or with a patch of hairs or papillae distally along the median line; abaxially with a retuse to rounded ridge near the base, surface distally convex, smooth to coarsely wrinkled; basal auricles inconspicuous. *Column* 1.2—2.2 mm long, column foot often with two weak, longitudinal ridges. *Stelidia* semi-elliptic or triangular, 0.6—0.9 mm long, rounded to acute, if triangular with a patent to antrorse, semi-circular to triangular, rounded to acute tooth along the upper margin, and with a similar tooth along the lower margin, sometimes with a second, retrorse tooth along the lower margin. *Anther*: front margin densely ciliate or papillose with elongated papillae, abaxial ridge $\pm$ glabrous.

Colours: Sepals whitish, creamy yellow, or yellowish green; margins, veins and sometimes transverse veins reddish purple. Petals the same, but without coloured transverse veins. Lip dark red purple, white near the base, and adaxially with a white, cream, or pink strip along the midvein. Flowers sometimes faintly scented.

Habitat & ecology: Understorey epiphyte in mixed dipterocarp forest and *kerangas* forest. Alt. 200—1400 m. Flowering in Jan—Mar, Jul, Sep, Oct.

Distribution: MALAYSIA: Peninsula (7 specimens seen); Sarawak (5); Sabah (3). INDONESIA: Sumatra (2); Kalimantan (1).

Notes: *Bulbophyllum hirtulum* shows infraspecific variability in the following characters:

- The median sepal may be reflexed instead of porrect (Sarawak).
- The lip may have a patch of hairs distally on the adaxial side of the lip (Sarawak).
- The lip may have two tiny pits near the tip, on the adaxial side (Sarawak, Peninsular Malaysia). The wall separating the pits may develop into a triangular, acute tooth forming a hood over the pits (Peninsular Malaysia).
- The stelidia may have a triangular, subacute tooth along their lower margin (Peninsular Malaysia, Sarawak, and Sumatra).
- The median slit on the adaxial side of the lip may extend over c. 1/5 of the length of the lip or more.
- The upper and the lower surface of the lip are entirely smooth, without corrugations (Sabah).

All these characters occur single, or in any number, and in various

combinations. Therefore, they cannot be used to distinguish infraspecific taxa.

123. *Bulbophyllum cerebellum* J.J. Verm. – Fig. 13, plate 7.

Bulbophyllum cerebellum J.J. Verm., *Blumea* 41 (1996) 350. – TYPE: 'Borneo' no further details known, *Giles* 998 (K, holo.).

Rhizome 2—2.5 mm diam., sections between pseudobulbs 0.4—1.3 cm long. *Pseudobulbs* touching, ovoid, 1.2—2.5 x 0.7—1.2 cm. *Petiole* 1.5—2.5 cm. *Leaf blade* elliptic to (ob)ovate, 5—14 x 1.5—3.5 cm, index (length/width) 3.3—4; acute. *Inflorescence* a very short and dense or a subumbellate raceme, 4—12 cm, 10—29-flowered. *Peduncle* patent to pendulous, 3.8—10 cm, bracts c. 5, the longest 3—6 mm long. *Rhachis* pendulous, spindle-shaped, 1—1.8 x c. 0.3 cm, glabrous. *Floral bracts* triangular, 1—1.5 x 0.8—1 mm, acute. *Flowers* not much opening, many simultaneously. *Pedicel* and *ovary* 2.6—3.5 mm long, basal node on a 0.2—0.3 mm-long stump. *Median sepal* ± porrect, triangular, 3.6—4.6 x 2—3 mm, index 1.2—1.9; acute, margins with scattered very fine papillae, base rather broadly attached; rather thin, surface glabrous. *Lateral sepals* somewhat recurved, 4—5.5 x 3.2—4.3 mm, index 1.2—1.3; rounded, upper margin glabrous, lower ciliolate, base broadly attached; otherwise as the median sepal. *Petals* porrect, ovate, 2.8—3.2 x 1.5—1.9 mm, index 1.5—1.9; rounded, margins sparsely and very finely ciliate, base rather narrowly attached; rather thin, surface glabrous. *Lip* abruptly recurved c. half-way, 3-lobed; *midlobe* ± elliptic, 2.6—3.4 x 1.4—3 mm, index 1.4—1.9; rounded, margins shortly and sparsely ciliate towards the tip; very thick, surface irregularly wrinkled except for the glabrous basal part; adaxially concave and with a short median slit near the base, with two distinct erect ridges diverging proximally, continuing over c. 1/3 of the lip and distally truncate, surface distally distinctly convex; abaxially with a wide, rounded ridge towards the base, distinctly convex towards the tip; *lateral lobes* attached along the proximal 1/3 of the lip, antrorse, falcate, ovate, rounded, entire, glabrous, broadly attached, rather thin. *Column* 1—1.5 mm long, column foot somewhat swollen, abaxially without a spur near the tip. *Stelidia* 0.7—1 mm long, acute, ± rectangular in outline, with or without a distinct, antrorse, deltoid, obtuse tooth along the upper margin and with a similar, obtuse to acute tooth along the lower margin. *Anther*: front margin papillose with elongated papillae, abaxial ridge ± glabrous.

Colours: Peduncle purplish or dark red, rhachis green. Pedicel and ovary yellowish green. Sepals yellow or yellowish green, with some brownish stains towards the tip or with brown veins. Petals yellow, with pale purple or brownish spots towards the tip. Lip bright yellow, base and lateral lobes

pale greenish, sometimes with brownish stains. Column yellow.

Habitat & ecology: Epiphyte in primary forest. Alt. c. 1300 m. Flowering in May, Oct.

Distribution: MALAYSIA: Sabah (3 specimens seen).

124. *Bulbophyllum clipeibulbum* J.J. Verm. – Fig. 14, plate 8.

Bulbophyllum clipeibulbum J.J. Verm., Malayan Orch. Rev. 35 (2001) 51. — TYPE: no locality, Hort. Salzburg OR 637/94 (SZU, holo.; SING, iso.).

Rhizome 5—6 mm diam., sections between pseudobulbs 3.5—4.5 cm long. *Pseudobulbs* touching, dorsiventrally discoid, 1.0—1.8 x 3.5—5.5 cm. *Petiole* 38—60 cm. *Leaf blade* elliptic-ovate, 14.5—22 x 4—6 cm, index (length/width) 2.8—4.4; acute. *Inflorescence* an elongated, lax raceme, c. 50-flowered. *Rhachis* arching or nodding, spindle-shaped, c. 19 x 0.7 cm (at an early stage of anthesis), slightly and finely rugose-verruculate. *Floral bracts* ovate to triangular, 4.5—5 x c. 1.5 mm, acute. *Flowers* not fully opening, several simultaneously. *Pedicel* and *ovary* c. 3.6 mm long, basal node on a 0.2—0.4 mm-long stump. *Median sepal* recurved at the tip, ovate-triangular, c. 9.8 x 2 mm, index c. 4.9; acuminate, margins very finely ciliate, base narrowly attached; rather thick, surface adaxially glabrous, abaxially very finely papillose. *Lateral sepals* triangular, c. 10.2 x 3 mm, index 3.4; upper margin glabrous but shortly papillose locally, base broadly attached; otherwise as the median sepal. *Petals* porrect, ovate, c. 1.5 x 0.9 mm, index 1.6—1.7; subacute, margins erose, long ciliate, base broadly attached; rather thin, surface glabrous but with a few hairs distally on both sides. *Lip* recurved and ovate in the proximal third, distally abruptly narrowed and drawn out into a slender, gradually tapering top part; c. 6.3 x 1.2 mm, index 5.2—5.3; tip subacute, margins ciliate near the base, elsewhere with long, thin, wavy hairs; lip rather thick in the proximal third, rather thin elsewhere; adaxially concave near the base, with two rounded ridges separated by a median furrow c. half-way up the proximal third, adaxial surface glabrous but very finely papillose at about 1/3 of its length; abaxially with a wide, rounded ridge towards the base, slightly convex elsewhere, surface glabrous but with a tuft of long, thin wavy hairs at about 1/3 of its length. *Column* c. 2.2 mm long, stigma protruding at its base. *Stelidia* subulate with a knob-shaped, rounded tip, c. 1.5 mm long; with an inconspicuous, rounded wing along the lower margin, at the base. *Anther*:

Figure 13. *Bulbophyllum cerebellum* J.J. Verm. (123) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, left: abaxial side, right: adaxial side; g. Pollinia, left: two pairs, right: single pair. – a. From a photograph by A. Kocyan; b. From Kocyan s.n. (spirit sample); c—g. From Giles 998 (spirit sample).

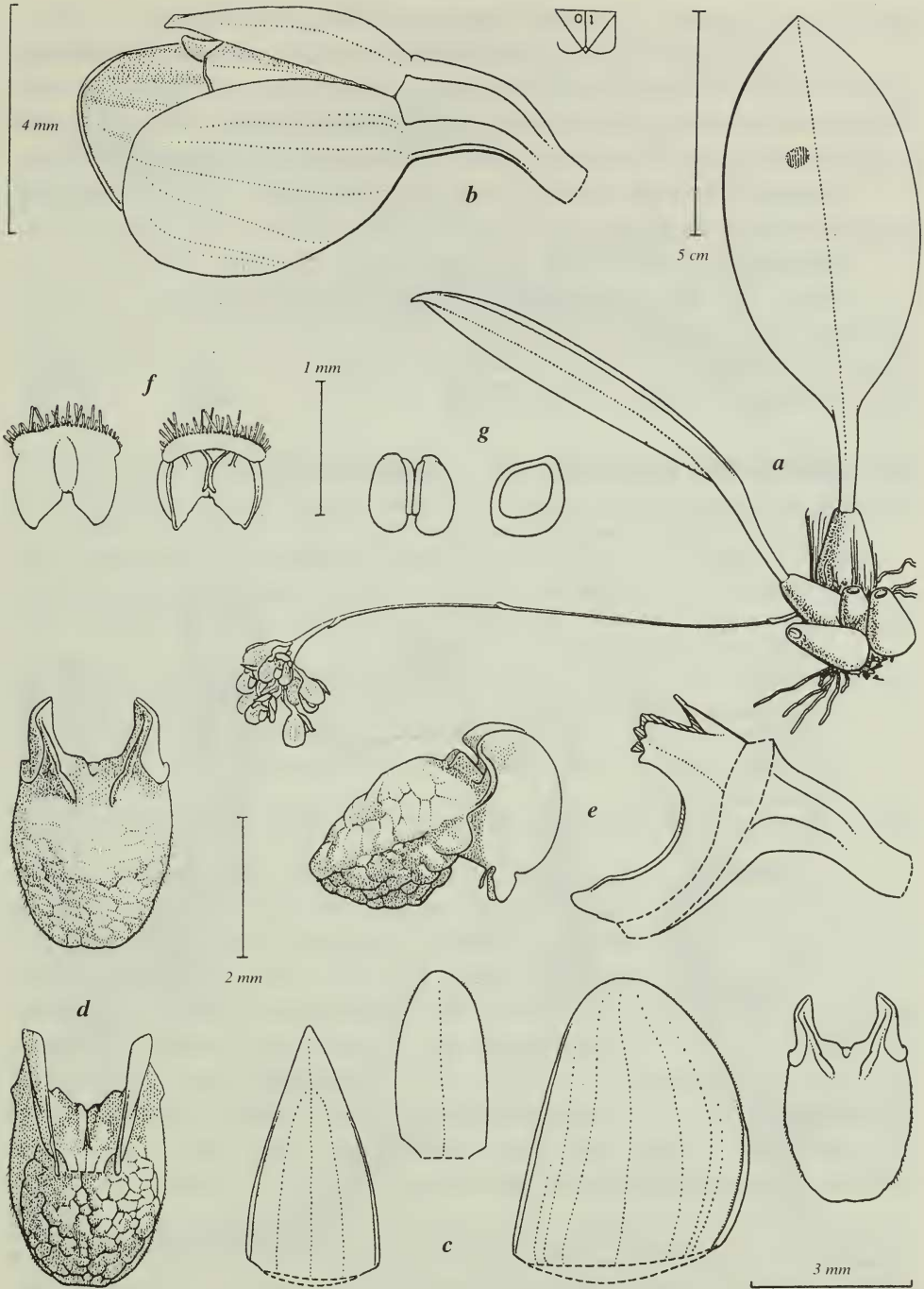


Figure 13. *Bulbophyllum cerebellum* J.J. Verm. (123)

front margin papillose, abaxially with many stiff hairs distally.

Colours: Plant medium green. Rhachis greenish, suffused with blackish purple. Sepals yellowish towards the base, cream-coloured towards the tip, suffused with reddish purple. Petals yellowish near the base, blackish purple elsewhere. Lip cream-coloured, marked with reddish purple, hairs yellow.

Habitat & ecology: Found as an epiphyte in open or closed primary evergreen forest on granite bedrock. Alt. 700—1500m. Flowering in Dec.

Distribution: VIETNAM: southern part (1 specimen seen).

Notes: All data on habitat, ecology and distribution are from L. Averyanov (pers. comm.). According to him, the inflorescence is up to 60 cm long and pendulous. The only specimen available to me has an incomplete inflorescence: the basal part is missing.

125. *Bulbophyllum penicillium* Par. & Rchb.f. in Rchb.f. – Fig. 15, plate 9.

Bulbophyllum penicillium Par. & Rchb.f. in Rchb.f., Trans. Linn. Soc. London, Bot. 30 (1874) 151; King & Pantling, Ann. Roy. Bot. Gard. (Calcutta) 8 (1898) 79, t. 108. – *Phyllorchis penicillium* (Par. & Rchb.f. in Rchb.f.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 677. — TYPE: Myanmar, Moulmein, *Parish 303* (K, holo.; W iso.).

Bulbophyllum inopinatum W.W. Sm., Notes Roy. Bot. Gard. Edinburgh 8 (1915) 346. – TYPE: *Hort. Edinburgh s.n.* (E, holo.).

[Not *B. penicillium sensu* Rolfe, J. Bot. 23 (1885) 215; Rolfe in Vidal y Soler, Phaner. Cum. Philipp. (1885) 80 & 149; Vidal y Soler, Rev. Pl. Vasc. Filip. (1886) 267; Ames, Philipp. J. Sci. 7 (1912) 128; Ames, Enum. Philipp. Fl. Pl. 1 (1925) 392. – Specimen: *Cuming 2076* (BM, W; = *B. flavescens* [Bl.] Lindl., sect. *Aphanobulbon*).]

[Not *B. penicillium sensu* Seidenfaden, Opera Bot. 124 (1995) 47 (= *B. lanuginosum*).]

Rhizome 2.5—4 mm diam., sections between pseudobulbs 1.2—3.5 cm long. *Pseudobulbs* close or distant, ovoid, 1.8—3.5 x 1.5—2 cm, laterally flattened(?). *Petiole* 4—7.5 cm. *Leaf blade* elliptic to (ob-)ovate, 12.5—20.5 x 1.8—3.6 cm, index (length/width) 4.7—8.2; acute. *Inflorescence* an elongated, lax raceme, 28—65 cm, 16—65-flowered. *Peduncle* ± patent, 15—29 cm, bracts 4—6, the longest 10—15 mm long. *Rhachis* arching or nodding, spindle-shaped, 12—50 x c. 0.5 cm, glabrous. *Floral bracts* ovate to triangular, 4—8 x 2—4 mm, acuminate. *Flowers* not fully opening, several simultaneously. *Pedicel* and *ovary* 5.5—6.5 mm long, basal node ± flush with the surface of the rhachis. *Median sepal* ± porrect, ovate to triangular,

Figure 14. *Bulbophyllum clipeibulbum* J.J. Verm. (124) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: abaxial side, right: adaxial side; g. Pollinia, left: single pair, right: two pairs. – a (plant). From *Hort. Vienna 099-B-160-2* (living plant); a (inflorescence)—g. From *Hort. Salzburg OR 637/94* (spirit sample).

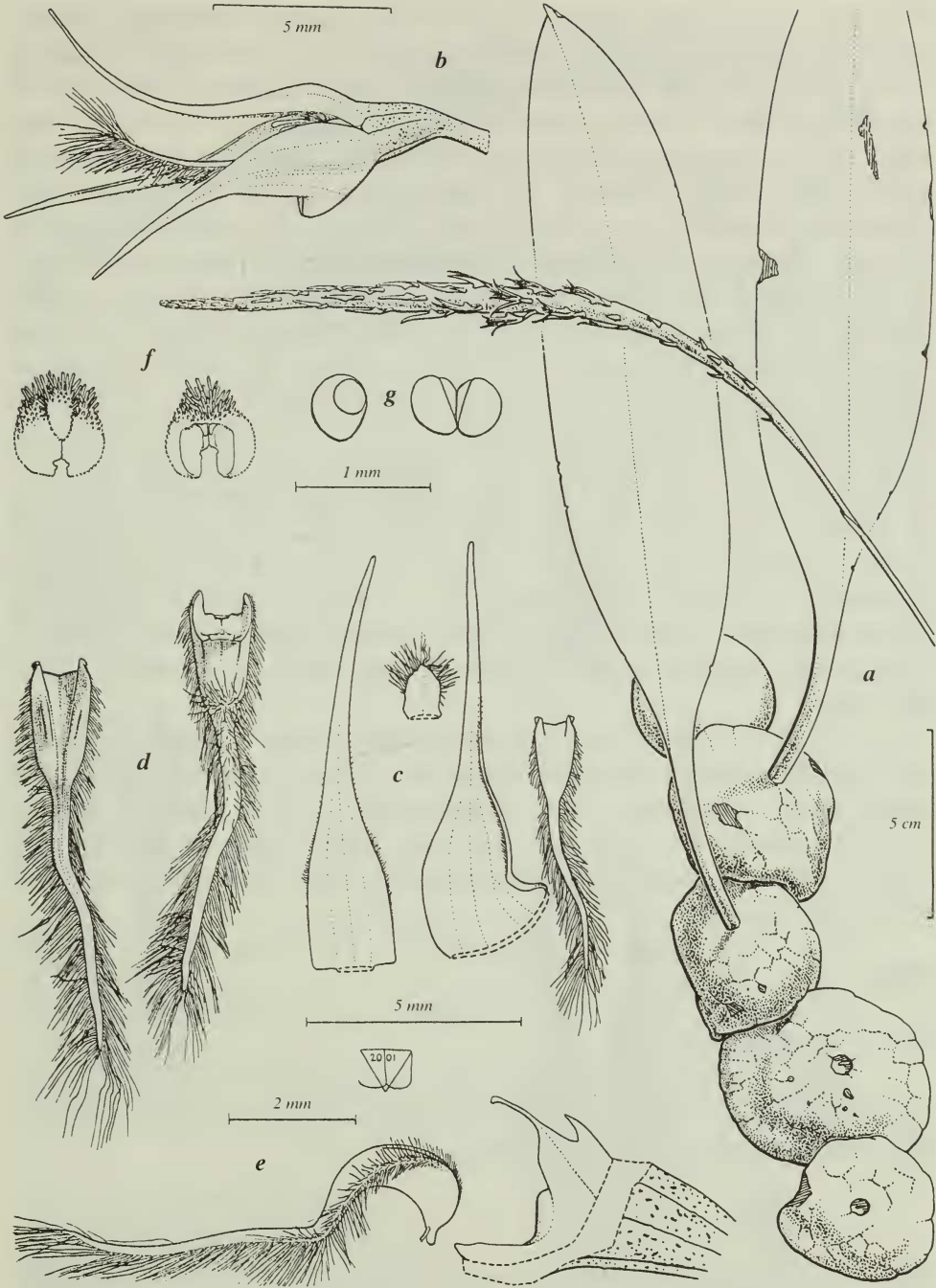


Figure 14. *Bulbophyllum clipeibulbum* J.J. Verm. (124)

7.5—12.5 x 1.8—3 mm, index 3.4—5.5; acute, margins very finely ciliate, base broadly attached; rather thin, surface glabrous. *Lateral sepals* recurved, 8—12 x 2.5—3.3 mm, index 2.9—4; upper margin glabrous, otherwise as the median sepal. *Petals* porrect, elliptic to ovate, 1—1.5 x 0.8—1.2 mm, index 1.2—1.4; rounded, margins long ciliate, base rather narrowly attached; rather thick, surface glabrous. *Lip* somewhat recurved in the basal half, ovate-subtriangular, 4—8 x 0.9—1.3 mm, index 4—6.7; gradually tapering towards a subacute tip, margins with stiff hairs over its entire length, those in the proximal third short, thin, those elsewhere short or long, slightly swollen; lip rather thick near the base, rather thin elsewhere; adaxially somewhat concave near the base, with three ridges, the lateral ridges low, rounded, towards the base almost touching over a deep slit before diverging, distally slightly diverging and continuing up to c. 1/2 of the lip, the median ridge starting near the ligament as a thick patch and continuing up to 1/3 of the lip as low, narrow, obtuse ridge, adaxial surface glabrous but slightly finely hirsute near the base; abaxially with a retuse ridge near the base, surface otherwise flat, glabrous. *Column* 1.8—3 mm long, stigma slightly protruding at its base. *Stelidia* subulate, 1—1.7 mm long, tip rounded; with an inconspicuous, rounded wing along the lower margin, at the base. *Anther*: front margin papillose and with some stiff hairs, abaxial ridge with scattered stiff hairs.

Colours: Rhachis dark brownish purple. Flowers greenish, marked with purple: sepals with purple veins, the lateral sometimes also with a purple blotch c. half-way; petals entirely purple, or with a purple top part, or with a purple vein and blotches along the margins; lip marked with purple or entirely purple; hairs on lip purple or pink with purple segments at irregular intervals.

Habitat & ecology: Alt. up to 2000 m. Flowering in Jan, Aug, Sep (May, Jun in cultivation).

Distribution: BHUTAN (1 specimen seen). INDIA: Assam (1). MYANMAR: Tenasserim (1).

Notes: In herbarium specimens the rhachis shrivels to about the same diameter as the peduncle; its thickness in fig. 15 has been estimated from the plate in King and Pantling (1898).

Figure 15. *Bulbophyllum penicillium* Par. & Rehb.f. in Rehb.f. (125) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, adaxial side; e. Lip, abaxial side; f. Column and lip, lateral view; g. Anther, above: abaxial side, below: adaxial side; h. Pollinia, left: two pairs, right: single pair. – a (plant). From *Parish 303*; a (inflorescence). From *Hort. Glasnevin s.n.*; b—h. From *O'Brien, d.d. 6-1895* (all herbarium specimens).

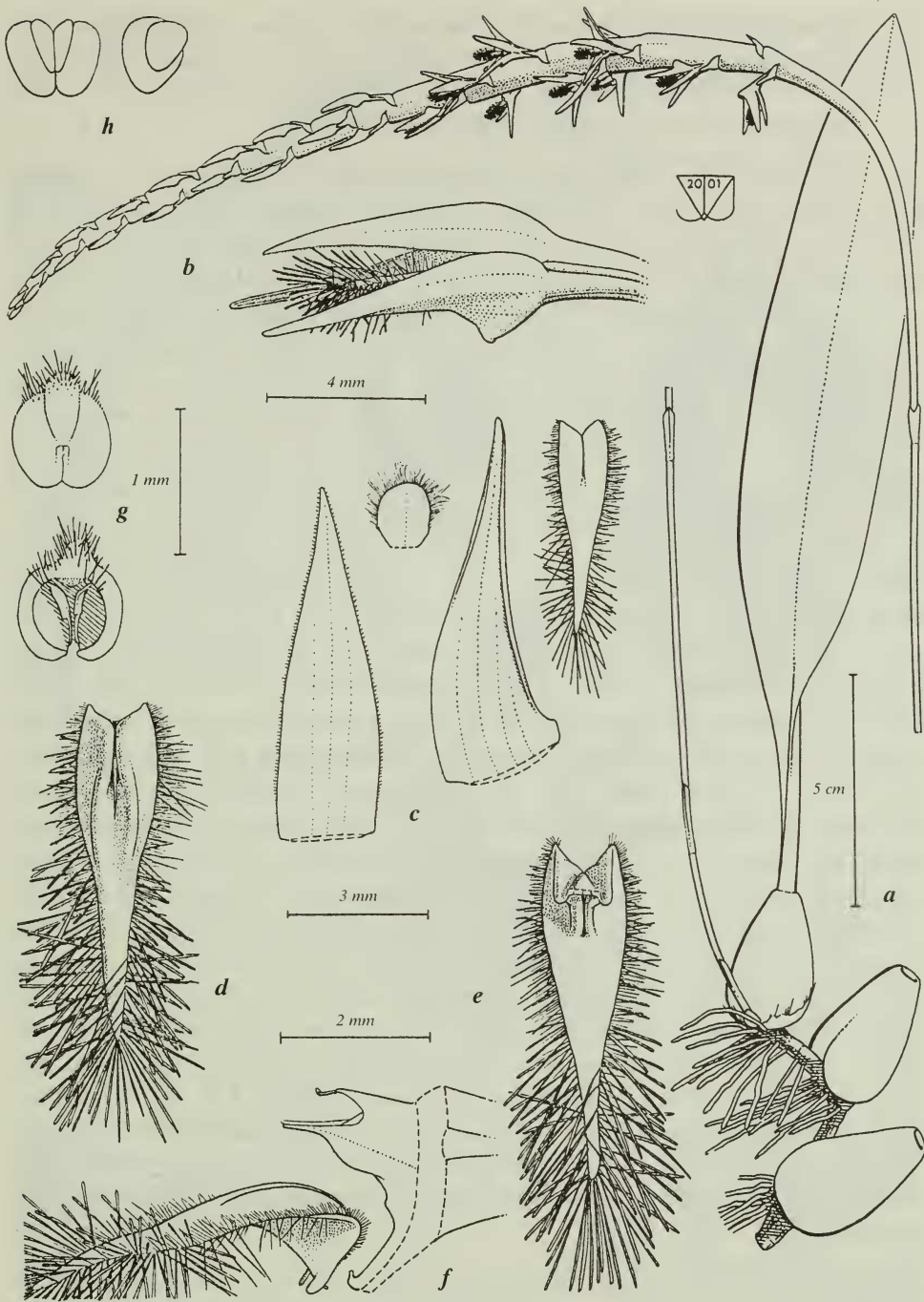


Figure 15. *Bulbophyllum penicillium* Par. & Rchb.f. in Rchb.f. (125)

126. *Bulbophyllum setuliferum* J.J. Verm. & L.G. Saw – Fig. 16, plate 10.

Bulbophyllum setuliferum J.J. Verm. & L.G. Saw, Gard. Bull. Singapore 52 (2000) 289.

— TYPE: Malaysia, Pahang, Cameron Highlands, near Tanah Rata, *Hort. Singapore SBG-O 490* (SING, holo.; KEP, KLU, iso.).

Rhizome 2.5—5 mm diam., sections between pseudobulbs 1.4—4 cm long. *Pseudobulbs* close or distant, depressed conical, 1.4—2.5 x 1.3—2.8 cm. *Petiole* 3—6.5 cm. *Leaf blade* elliptic to (ob-)ovate, 10—17 x 2—3.2 cm, index (length/width) 3.7—6.1; acute to slightly acuminate. *Inflorescence* an elongated, lax raceme, 33—80 cm, 22—68-flowered. *Peduncle* ± patent, 22—39 cm, bracts 5—6, the longest 6—9 mm long. *Rhachis* (slightly) nodding, spindle-shaped, flattened or not, 11—41 x 0.4—0.9 cm, glabrous, without blackish dots. *Floral bracts* triangular, 5—6.6 x 2—3.2 mm, acute. *Flowers* not much opening, one at a time or a few simultaneously. *Pedicel* and *ovary* 3—4 mm long, without blackish dots, basal node ± flush with the surface of the rhachis. *Median sepal* porrect or little incurved, triangular, 6—7.5 x 1.8—2 mm, index 3—3.8; acute, margins very finely ciliate, base rather broadly attached; rather thin, surface adaxially finely hirsute, abaxially glabrous. *Lateral sepals* recurved, 6—8 x 2.1—2.5 mm, index 2.6—3.3, upper margin glabrous; otherwise as the median sepal. *Petals* porrect, transversely elliptic to reniform, 0.7—0.8 x 0.9—1.1 mm, index 0.6—0.7; rounded, margins long ciliate, base narrowly attached; rather thin, surface glabrous. *Lip* slightly curved in the proximal half, subspathulate, 3.5—4 x c. 1.2 mm, index 2.9—3.3; truncate to rounded, margins ciliate along the proximal 2/3 of the lip and with long, slightly club-shaped hairs along the distal 2/3, the latter increasing in length and thickness towards the tip of the lip; very thick; adaxially concave near the base and near the tip, slightly convex in between, with a thin median slit up to 1/4—1/3 of the lip, with a distinct, narrow median ridge over ± the entire length of the lip and overtopping its front as a high crest, adaxial surface glabrous but finely hirsute near the base; abaxially with a retuse ridge towards the base, with a distinctly convex top part with scattered club-shaped hairs arising from tiny pits, surface otherwise glabrous. *Column* 1.5—2.1 mm long, column foot slightly swollen. *Stelidia* falcate, triangular, 0.5—1 mm long, acute, with a deltoid, rounded wing along the lower margin, at the base. *Anther*: front margin and abaxially towards the tip papillose with elongated papillae.

Figure 16. *Bulbophyllum setuliferum* J.J. Verm. & L.G. Saw (126) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, below: adaxial side, above: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, left: single pair, right: two pair. – a. From *Hort. Singapore SBG-O 490*; b–g. From *Hort. Singapore SBG-O 625* (both spirit samples).

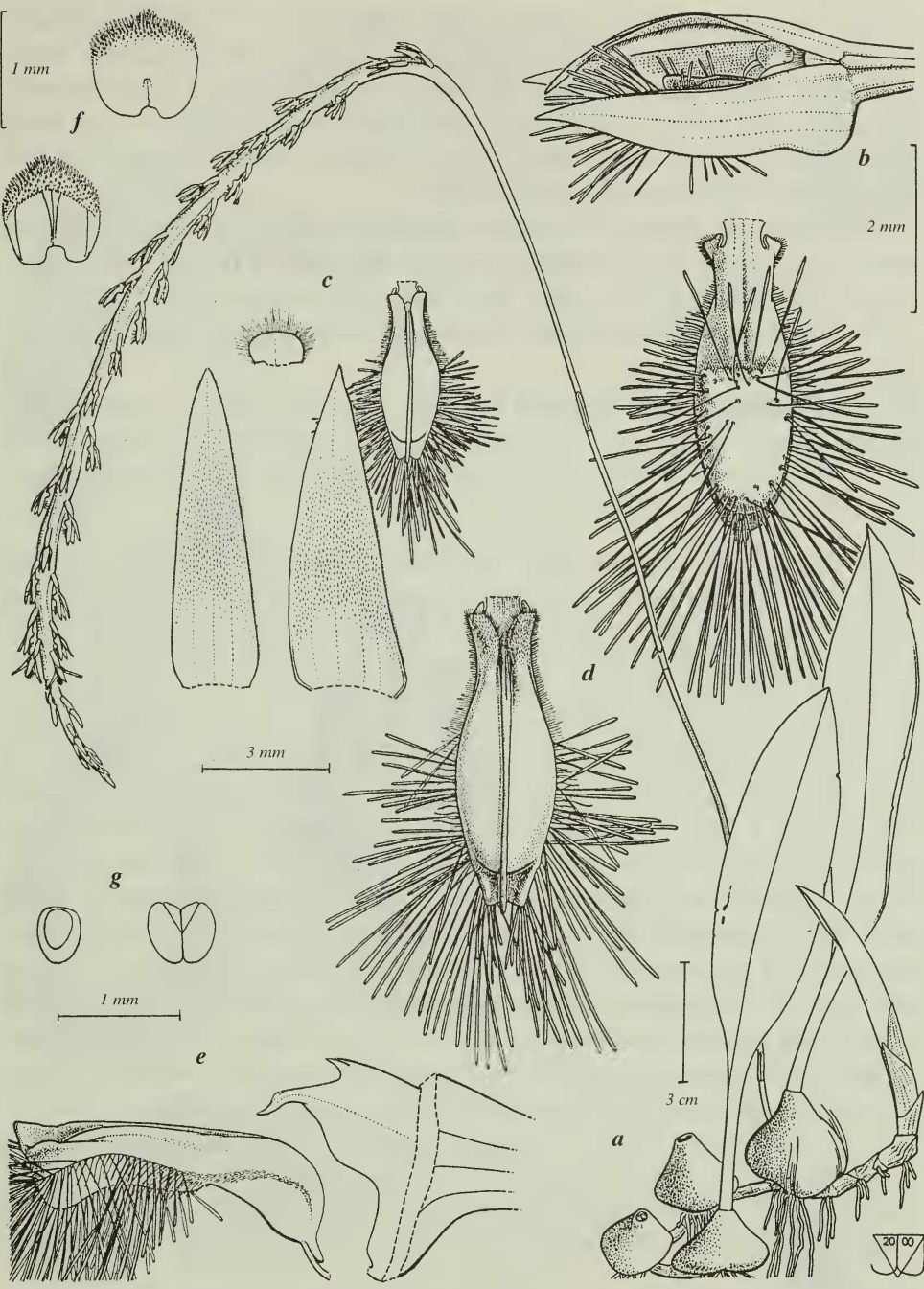


Figure 16. *Bulbophyllum setuliferum* J.J. Verm. & L.G. Saw (126)

Colours: Inflorescence and sepals pale green to whitish, suffused with dull reddish purple; the sepals proximally around the veins only. Petals translucent with a purple margin. Lip cream-coloured, with a purple margin, and often with some purple spotting on both surfaces. Hairs on lip shiny reddish purple, sometimes partly green. Column yellowish green, foot and wings below stelidia marked with purple.

Habitat & ecology: In (lower) montane forest, on tree trunks and branches, in shade; also found in moss at the foot of a tree. Alt. 1500–1800 m. Flowering in Feb–Jun, Nov (May, Sep, Oct in cultivation).

Distribution: MALAYSIA: Peninsula (7 specimens seen).

127. *Bulbophyllum sororculum* J.J. Verm., sp. nov. – Fig. 17, plate 11.

Bulbophyllum sororculum J.J. Verm., a *Bulbophyllo aithorhachide* in inflorescentibus erectis, labello adaxialiter glabro differt. — TYPE: Indonesia, Sulawesi, central part, *M. Brans* s.n. (WU, holo.).

Rhizome 2.2–4 mm diam., sections between pseudobulbs 1.4–3 cm long. **Pseudobulbs** distant, (depressed) conical, 1–1.4 x 0.8–2.2 cm. **Petiole** 1.4–2.5 cm. **Leaf blade** elliptic, 6–13.5 x 1.4–2.6 cm, index (length/width) 3.3–5.8; acute. **Inflorescence** an elongated, lax raceme, erect to patent, c. 17 cm (not fully developed), c. 22-flowered. **Peduncle** c. 9.5 cm, bracts c. 4, the longest c. 8 mm long. **Rhachis** spindle-shaped, c. 7.5 x 0.4 cm (not fully developed), with many minute, blackish dots. **Floral bracts** triangular, c. 4.5 x 2.8 mm, acute. **Flowers** opening wide, a few simultaneously. **Pedicel** and **ovary** c. 2.5 mm long, with minute blackish dots, basal node on a c. 0.8 mm-long stump. **Median sepal** reflexed, ovate, c. 5.2 x 2 mm, index c. 2.6; acute, margins very finely ciliate, base rather narrowly attached; rather thick, surface adaxially sparsely hirsute, abaxially with few minute blackish dots near the base. **Lateral sepals** incurved to reflexed, triangular, c. 5 x 2.5 mm, index c. 2; acuminate, upper margin glabrous; otherwise as the median sepal. **Petals** porrect, (ob-)ovate, 1.2–2 x 1–1.2 mm, index 1.2–1.7; rounded, margins long ciliate towards the tip, base rather narrowly attached; rather thin, surface glabrous. **Lip** recurved in the proximal half, subspathulate, c. 3.2 x 1.1 mm, index 2.4–2.5; rounded, margins with long hairs increasing in length and thickness towards the tip of the lip; very thick; adaxially concave near the base, convex elsewhere, with a distinct, narrow median ridge embedded in a furrow over the distal 2/3 of the lip, protruding from

Figure 17. *Bulbophyllum sororculum* J.J. Verm. (127) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: abaxial side, right: adaxial side; e. Column and lip, lateral view; f. Anther, left: abaxial side, right: adaxial side; g. Pollinia, above: single pair, below: two pairs. – All from *M. Brans* s.n. (spirit sample).

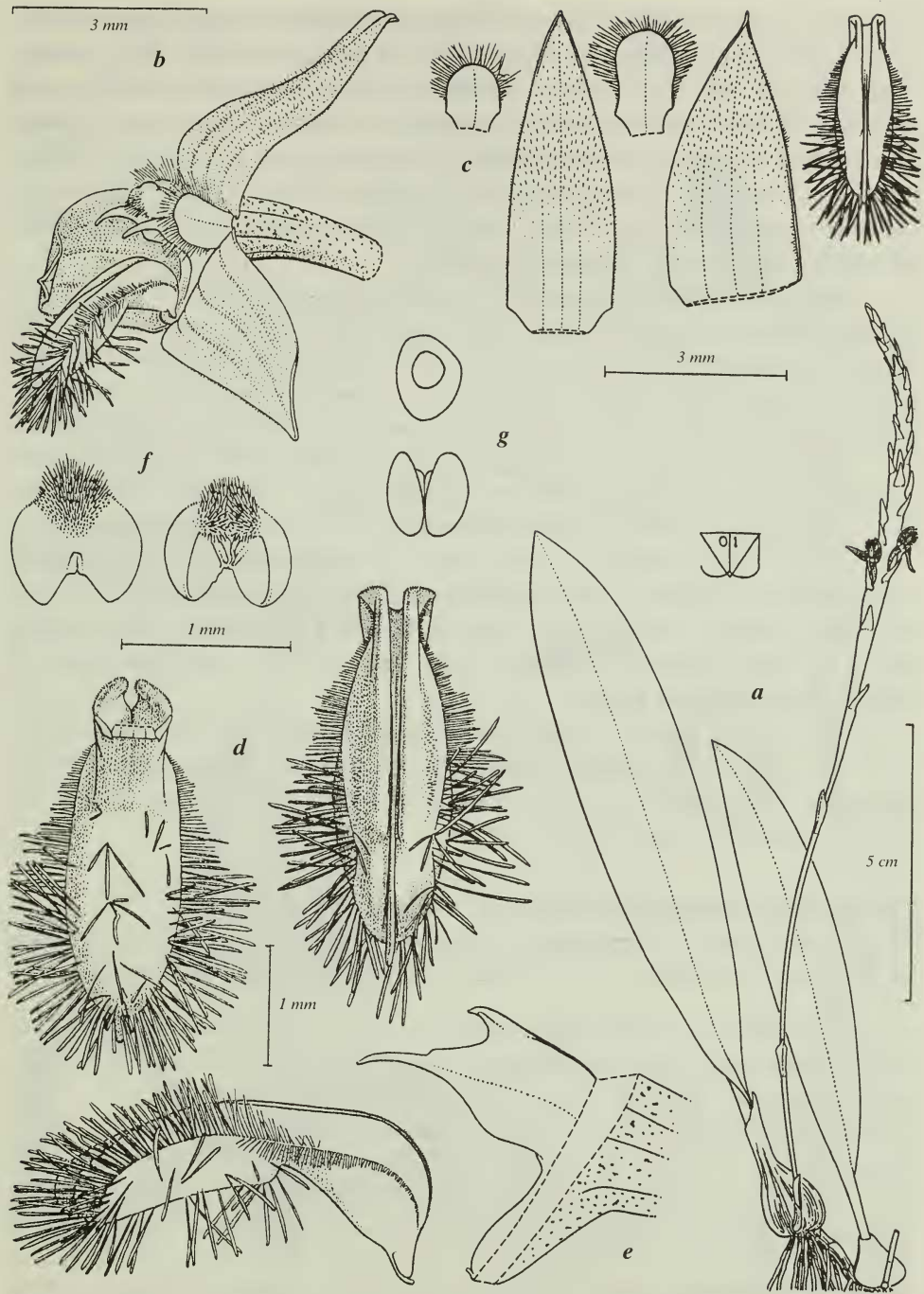


Figure 17. *Bulbophyllum sororculum* J.J. Verm. (127)

the furrow in the distal 1/3 and overtopping its front as a high crest, adaxial surface glabrous but finely hirsute near the base; abaxially with a retuse ridge towards the base, with a distinctly convex top part with scattered club-shaped hairs, surface otherwise glabrous. *Column* c. 2 mm long, column foot slightly swollen, abaxially without a spur near the tip. *Stelidia* slightly falcate, subulate, c. 1.1 mm long, acute, with a deltoid, obtuse wing along the lower margin, at the base. *Anther*: front margin and abaxial ridge densely papillose with elongated papillae.

Colours: Rhachis dull purplish red with tiny green spots. Floral bracts green, suffused with dull purple. Sepals greenish, heavily spotted with dull purple. Petals greenish at base, white in the middle, grading into a blackish purple top part; hairs yellow. Lip greenish at the base, yellowish elsewhere, margins and median crests almost black, elsewhere with almost black spots.

Habitat & ecology: Epiphyte in primary forest, on the bole of a tree c. 3 m above the ground, at c. 500 m alt. Flowering in Oct, Nov in cultivation.

Distribution: INDONESIA: Sulawesi, central part (1 specimen seen).

Notes: *Bulbophyllum sororculum* is in some respects intermediate between *B. setuliferum* and *B. aithorhachis*. The former differs in having a lip with a concave top part, the latter in having a pendulous inflorescence and a lip that is hirsute distally on the adaxial side; and both differ in having less elongated petals.

One of the flowers available had the two petals of different lengths.

The species is remarkable for the asymmetrically opening flowers: these are kept so close to the rhachis that the lateral sepal facing the rhachis cannot spread properly.

128. *Bulbophyllum aithorhachis* J.J. Verm. – Fig. 18, plate 12, 13.

Bulbophyllum aithorhachis J.J. Verm., *Blumea* 41 (1996) 349. — TYPE: Brunei, Sungei Ingei, surroundings of Batu Melintang, *Jongejan cult.* 2219 (L, holo.).

Rhizome 3—4 mm diam., sections between pseudobulbs 1—2.5 cm long. *Pseudobulbs* close or distant, depressed conical, 0.6—1.4 x 1.1—2.2 cm. *Petiole* 0.8—3.8 cm. *Leaf blade* elliptic to ovate, 9—16 x 1.7—4 cm, index (length/width) 4.0—5.3; acute. *Inflorescence* an elongated, lax raceme, pendulous, 27—50 cm, 22—50-flowered. *Peduncle* 16—28 cm, bracts 4—5, the longest 7—12 mm long. *Rhachis* spindle-shaped, 10—22 x 0.8—1.2 cm, with many minute blackish dots. *Floral bracts* triangular, 3.5—4 x 4—5

Figure 18. *Bulbophyllum aithorhachis* J.J. Verm. (128) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, left: two pairs, right: single pair. – All from *Jongejan cult.* 2219 (spirit sample).

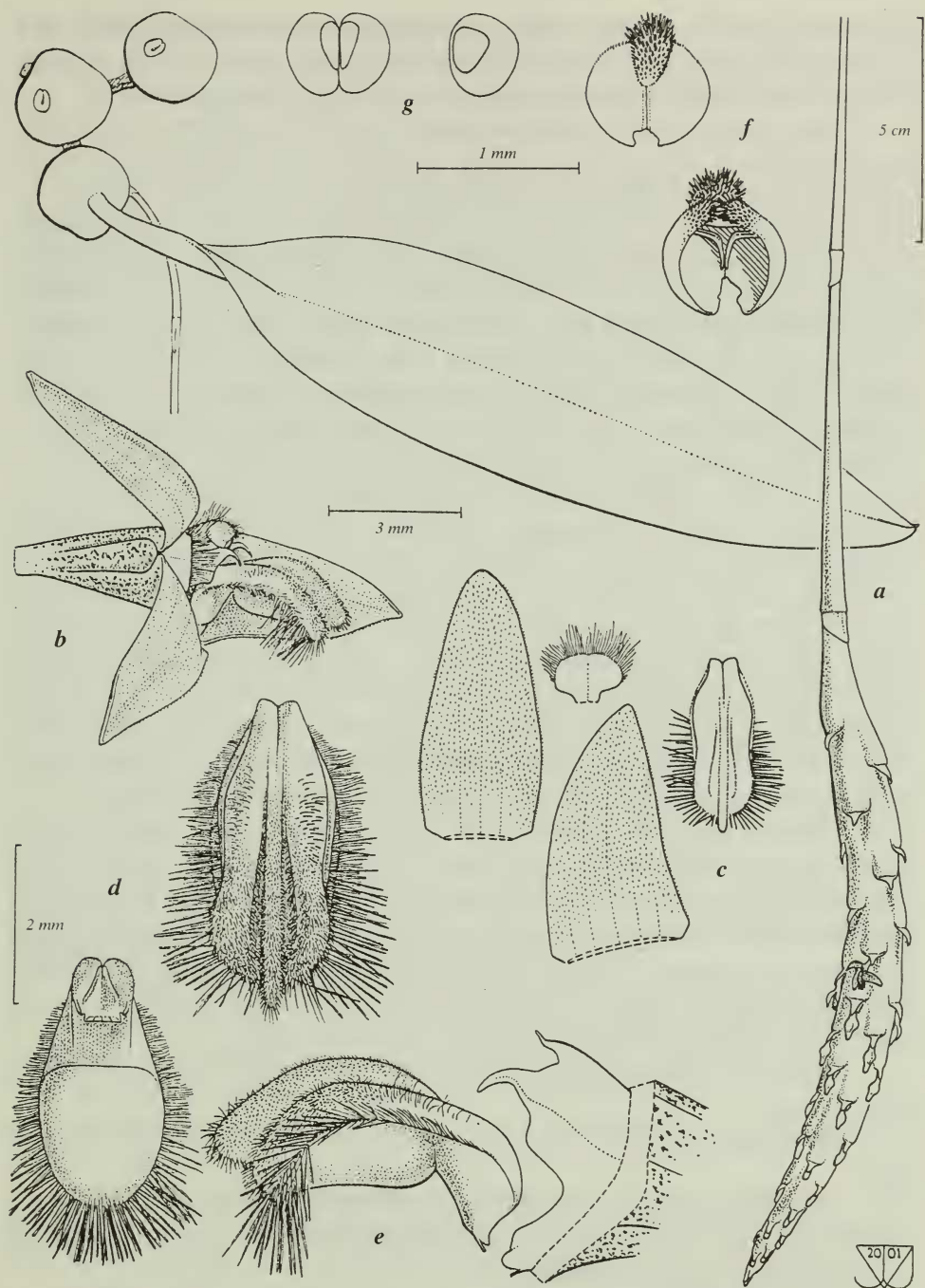


Figure 18. *Bulbophyllum aithorhachis* J.J. Verm. (128)

mm, acute. *Flowers* opening wide, a few simultaneously. *Pedicel* and *ovary* c. 4 mm long, with many minute blackish dots, basal node $\pm$ flush with the surface of the rhachis. *Median sepal* recurved to reflexed, ovate, 5.5–6 x 2–2.5 mm, index 2.2–3; obtuse, margins very finely ciliate, base rather broadly attached; rather thick, surface adaxially sparsely hirsute, abaxially with few minute blackish dots near the base. *Lateral sepals* porrect to spreading, triangular, 5.2–6.2 x 2.2–3 mm, index 1.7–2.9, upper margin glabrous; otherwise as the median sepal. *Petals* porrect, transversely elliptic to reniform, 0.8–1.2 x 1.3–1.6 mm, index 0.6–0.8; rounded, margins long ciliate towards the tip, base narrowly attached; rather thick, surface glabrous. *Lip* abruptly recurved in the proximal half, obovate, 3.3–4 x c. 1.3 mm, index 2.4–2.5; rounded, margins with long hairs increasing in length and thickness towards the tip of the lip; very thick; adaxially hardly concave and with two proximally diverging calli near the base, with a median slit up to 1/4 of the lip, with three distinct, obtuse ridges almost from base to tip, the lateral low and wide, diverging proximally and distally, running parallel and close together $\pm$ half-way up the lip, the median ridge high and narrow, starting in the proximal half and overtopping the front of the lip as a high crest, adaxial surface irregularly hirsute except near the base; abaxially with a wide, retuse ridge towards the base, convex towards the tip, surface finely velutinous distally, glabrous proximally. *Column* c. 2 mm long, column foot slightly swollen. *Stelidia* falcate, triangular, c. 0.7 mm long, acute, with a deltoid, obtuse wing along the lower margin, at the base. *Anther*: front margin and abaxial ridge densely papillose with elongated papillae.

Colours: Rhachis, pedicel and ovary pale greenish, suffused with reddish purple. Flowers pale greenish or yellow, the parts marked with dark reddish purple: the sepals spotted, particularly towards the margins and near the veins, the petals along the top margin, the lip adaxially towards the margins, abaxially towards the tip. Cilia along the petals and thicker hairs along the top part of the lip dark reddish purple; but hairs on the midrib and fine hairs along the margins of the lip white.

Habitat & ecology: Primary forest. Alt. 50–800 m. Found with mature fruits in Apr.

Distribution: BRUNEI (1 specimen seen). INDONESIA: Sumatra (1).

Notes: As in the previous species, the flowers cannot open completely because they are held so close to the rhachis that the lateral sepal facing the rhachis is trapped in between.

The Sumatra specimen only has fruits and could either be this or *B. setuliferum*. On account of the very thin peduncle (indicating a pendulous inflorescence), the rhachis structure, and the length of the floral bracts, it has been included here.

129. *Bulbophyllum echinophilum* F. Kraenzl. – Fig. 19. (probably extinct)

Bulbophyllum echinophilum F. Kraenzl., Repert. Spec. Nov. Regni Veg. 17 (1921) 385; Ames, Sched. Orch. 6 (1923) 81. — TYPE: Philippines, Manila, *Hort. Muenchen* (*Loher s.n.*) d.d. 1916 (B[?], holo., destroyed; AMES, iso.).

Pseudobulbs close or distant, depressed conical, 1.2–2.5 x 1.6–2.0 cm. *Petiole* c. 1.1 cm. *Leaf blade* elliptic, 7.5–10 x 1.4–2 cm, index (length/width) 5–5.3. *Inflorescence* an elongated, lax raceme c. 17 cm, 18–20-flowered. *Peduncle* ± patent, c. 9 cm. *Rhachis* arching or nodding, spindle-shaped, c. 8 x 0.5 cm. *Pedicel* and *ovary* c. 3–4 mm long, with scattered minute blackish dots. *Median sepal* recurved to reflexed, ovate, c. 5.8 x 1.7 mm, index c. 3.4; acute, margins very finely ciliate, base rather broadly attached; rather thin, surface adaxially finely hirsute, abaxially with few minute, blackish dots near the base. *Lateral sepals* recurved, subtriangular, c. 6 x 2 mm, index c. 3, upper margin finely papillose; otherwise as the median sepal. *Petals* porrect, elliptic, c. 1.2 x 1 mm, index c. 1.2; rounded, margins long ciliate, base narrowly attached; thin, surface glabrous except for a small tuft of hairs on the abaxial side. *Lip* almost straight, ± elliptic, c. 3.7 x 0.9 mm, index c. 4.1; rounded, margins ciliate except near the base and near the tip and with long, ± straight, slightly club-shaped hairs along the distal 2/3, the latter increasing in length towards the tip of the lip; very thick; adaxially concave near the base, with three distinct, obtuse ridges, the two lateral ridges wide, diverging proximally, the median higher and narrow, all three ridges fusing into a single ridge well before the front of the lip, adaxial surface glabrous but finely hirsute near the base; abaxially with a weak, retuse ridge towards the base, with a distinctly convex top part with scattered club-shaped hairs arising from tiny pits, surface otherwise glabrous. *Column* c. 1.8 mm long, column foot slightly swollen. *Stelidia* slightly falcate, triangular, c. 0.7 mm long, acute.

Colours: Pseudobulbs reddish. Rhachis dull purple with white spots. Sepals yellowish green, with tiny reddish brown dots. Petals white with reddish brown margins. Lip yellowish green, hairs yellowish brown.

Habitat & ecology: Flowering in Dec in cultivation.

Distribution: PHILIPPINES: Luzon (1 specimen seen). Not collected since c. 1910.

Notes: Only known from an incomplete isotype specimen. The description of the vegetative parts has been copied from Kraenzlin's description and his notes with the isotype material.

Ames (1923) doubted its provenance on account of a superficial resemblance to African species. As it fits well in sect. *Hirtula*, however, it is clearly of Asian origin.

130. *Bulbophyllum lanuginosum* J.J. Verm., *sp. nov.* – Fig. 20.

Bulbophyllum lanuginosum J.J. Verm., a *Bulbophyllo penicillio* labello adaxialiter crista distincta, pilis lanatis secus margines differt. — TYPE: Thailand, purchased on Bangkok market, *Thaitong 1395* (C, holo.).

Bulbophyllum penicillium sensu Seidenfaden, *Opera Bot.* 124 (1995) 47, **colour photograph pl. 9b**, non Par. & Rechb.f. in Rechb.f.

Rhizome c. 2 mm diam., sections between pseudobulbs c. 0.6 cm long. *Pseudobulbs* ?close, ovoid, c. 1.2 x 1.2 cm. *Petiole* 1.5 cm. *Leaf blade* elliptic, c. 9 x 1.5 cm, index (length/width) c. 6; acute. *Inflorescence* an elongated, lax raceme, 9.5–14 cm, 16–20-flowered. *Peduncle* ± erect, 3–4 cm, bracts c. 4, the longest 4–4.5 mm long. *Rhachis* erect, swollen, ± circular in section, 6.5–10 x c. 0.15 cm, glabrous. *Floral bracts* triangular, 2.5–3 x 1.5–1.8 mm, acute. *Flowers* opening wide, one at a time or a few simultaneously. *Pedicel* and *ovary* 2–2.2 mm long, without minute blackish dots, basal node on a 0.7–1 mm-long stump. *Median sepal* spreading to reflexed, triangular, c. 6.5 x 1.9 mm, index c. 3.4; acute, margins very finely ciliate, base rather broadly attached; rather thin, surface adaxially very finely hirsute locally, abaxially glabrous. *Lateral sepals* c. 6 x 2 mm, index c. 3, upper margin ± glabrous; otherwise as the median sepal. *Petals* porrect, transversely elliptic, c. 0.9 x 1.2 mm, index 0.7–0.8; subacute, margins long ciliate, base narrowly attached; thin, surface glabrous. *Lip* somewhat recurved in the basal half, ± oblong, c. 3 x 0.9 mm, index 3.3–3.4; rounded, margins ciliate near the base and with long, thin, wavy hairs near the tip, with shorter, thin, ± straight hairs in between; very thick; adaxially slightly concave and with two calli near the base, with a thin median slit up to c. 1/3 of the lip, with three distinct, obtuse ridges fused into a crest that increases in height into a high and narrow wedge distally, the two lateral ridges wide, diverging proximally, forming the edges of the wedge distally, the median ridge narrow, ending just before the end of the wedge, adaxial surface glabrous but finely hirsute near the base; abaxially with a retuse ridge towards the base, with a distinctly convex top part with long, thin, wavy hairs, surface otherwise glabrous. *Column* c. 1.6 mm long, stigma protruding at its base. *Stelidia* subulate, c. 0.9 mm long, acute, with a large, antrorse, triangular, acute tooth along the upper margin. *Anther*: front margin papillose, abaxially towards the tip with elongated papillae.

Colours: Rhachis, bracts, pedicel and ovary greenish. Flowers greenish; sepals with brownish purple veins, petals with brownish purple

Figure 19. *Bulbophyllum echinochilum* Kraenzl. (129) – a. Pseudobulb and leaf; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view. – All from *Hort. Muenchen (Loher s.n.) d.d. 1916* (poor quality herbarium specimen).

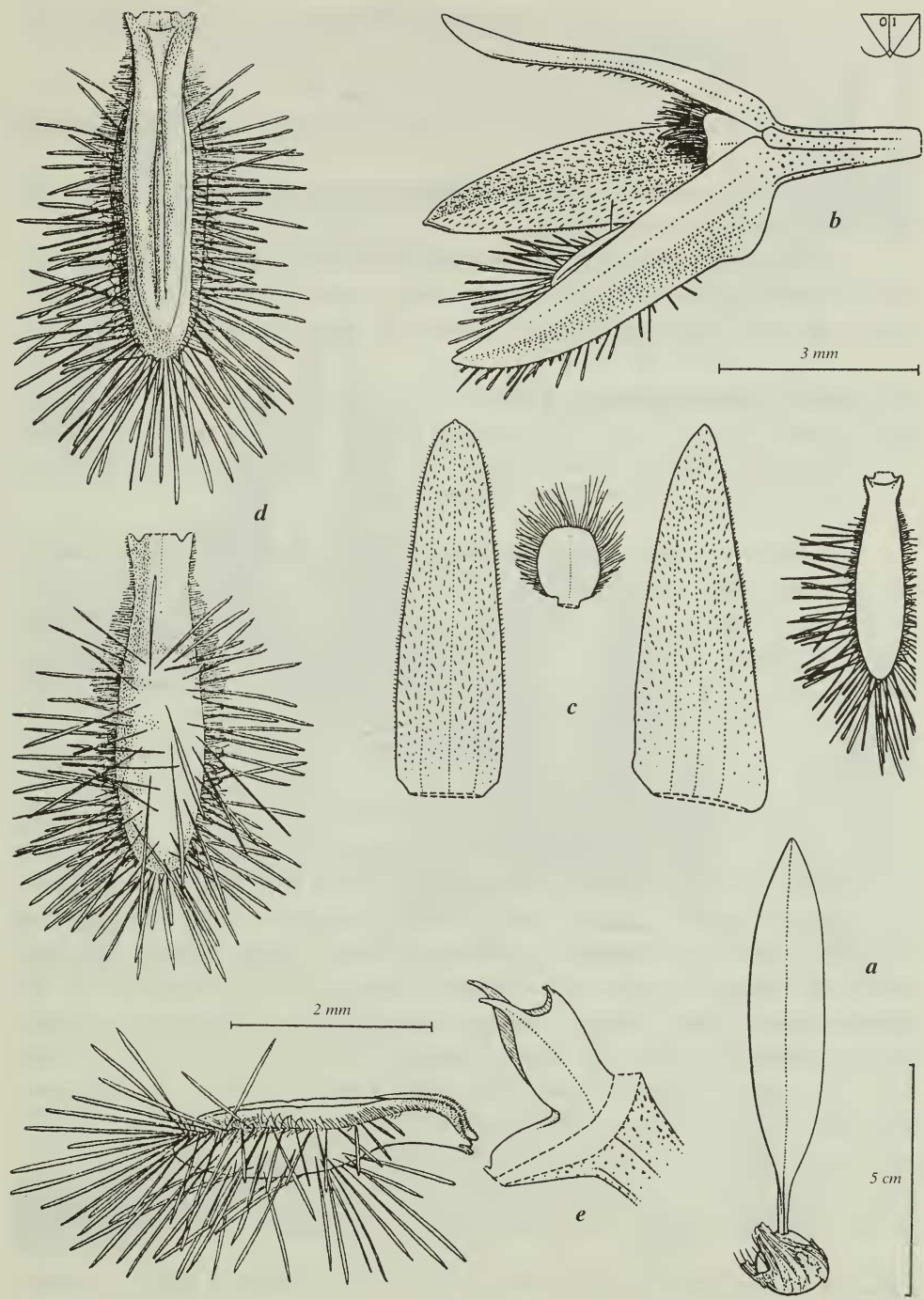


Figure 19. *Bulbophyllum echinochilum* Kraenzl. (129)

hairs, and lip with the lateral crests and the abaxial side similarly coloured. Shorter, stiff hairs on lip purple, the long, wavy hairs white.

Habitat & ecology: Flowering observed in Jun.

Distribution: THAILAND: 'probably Kanburi area' (1 specimen seen).

Notes: Only known from the type specimen. The description of the vegetative parts is not complete.

Erroneously identified by Seidenfaden (1995) as *B. penicillium*; it differs from that species in its smaller stature, shorter peduncle, its crested, obtuse lip with woolly, wavy hairs (hence the specific epithet).

131. *Bulbophyllum atratum* J.J. Sm. – Fig. 21, plate 14.

Bulbophyllum atratum J.J. Sm., Bull. Jard. Bot. Buitenzorg, s. 2, 25 (1917) 73. – TYPE: Indonesia, Sumatra, Barisan Range, *Hort. Bogor* (leg. Ajoeb, Exp. Jacobson) 862 (BO, holo., not seen, likely isotypes in L).

Rhizome 1–2 mm diam., sections between pseudobulbs 0.4–0.8 cm long. *Pseudobulbs* touching, ovoid, 0.5–1.0 x 0.6–1 cm. *Petiole* 2–3 cm. *Leaf blade* elliptic to ovate, 10–14.5 x 2.5–4.3 cm, index (length/width) 3.3–4.6; obtuse. *Inflorescence* an elongated, rather lax to rather dense raceme, entirely pendulous, 35–50 cm, 8-40-flowered. *Peduncle* 25–33 cm, bracts 4–5, the longest 6–10 mm long. *Rhachis* swollen, $\pm$ circular in section, 9.5–16.5 x 0.3–0.5 cm, glabrous, top 2–7 cm with minute, sterile bracts only. *Floral bracts* triangular, 0.8–1 x 1–1.2 mm, acuminate. *Flowers* not fully opening, many simultaneously. *Pedicel* and *ovary* 2.3–3 mm long, papillose-hirsute, basal node on a 0.2–0.3 mm-long stump. *Median sepal* $\pm$ porrect and incurved distally, triangular, 5–5.5 x 1.5–2 mm, index 2.5–3.7; acute, margins ciliolate, base broadly attached; rather thin, surface adaxially glabrous, abaxially papillose-hirsute. *Lateral sepals* (slightly) recurved, falcate, 4–4.2 x 2.5–2.9 mm, index 1.3–1.7; otherwise as the median sepal. *Petals* porrect, falcate, ovate with or without two minute teeth proximally along the lower margin, 3.5–4 x 1.2–1.5 mm, index 2.5–2.9; acute, margins ciliate with cilia longer towards the tip, base narrowly attached; thin, surface glabrous except for a few hairs near the tip. *Lip* abruptly recurved c. half-way, elliptic to obovate, 1.8–2.2 x 1–1.3 mm, index 1.5–2; rounded, margins ciliate except near the base; very thick; adaxially hardly concave and with 2 inconspicuous calli and a short

Figure 20. *Bulbophyllum lanuginosum* J.J. Verm. (130) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, left: two pairs, right: single pair. – All from *Thaitong 1395* (spirit sample).

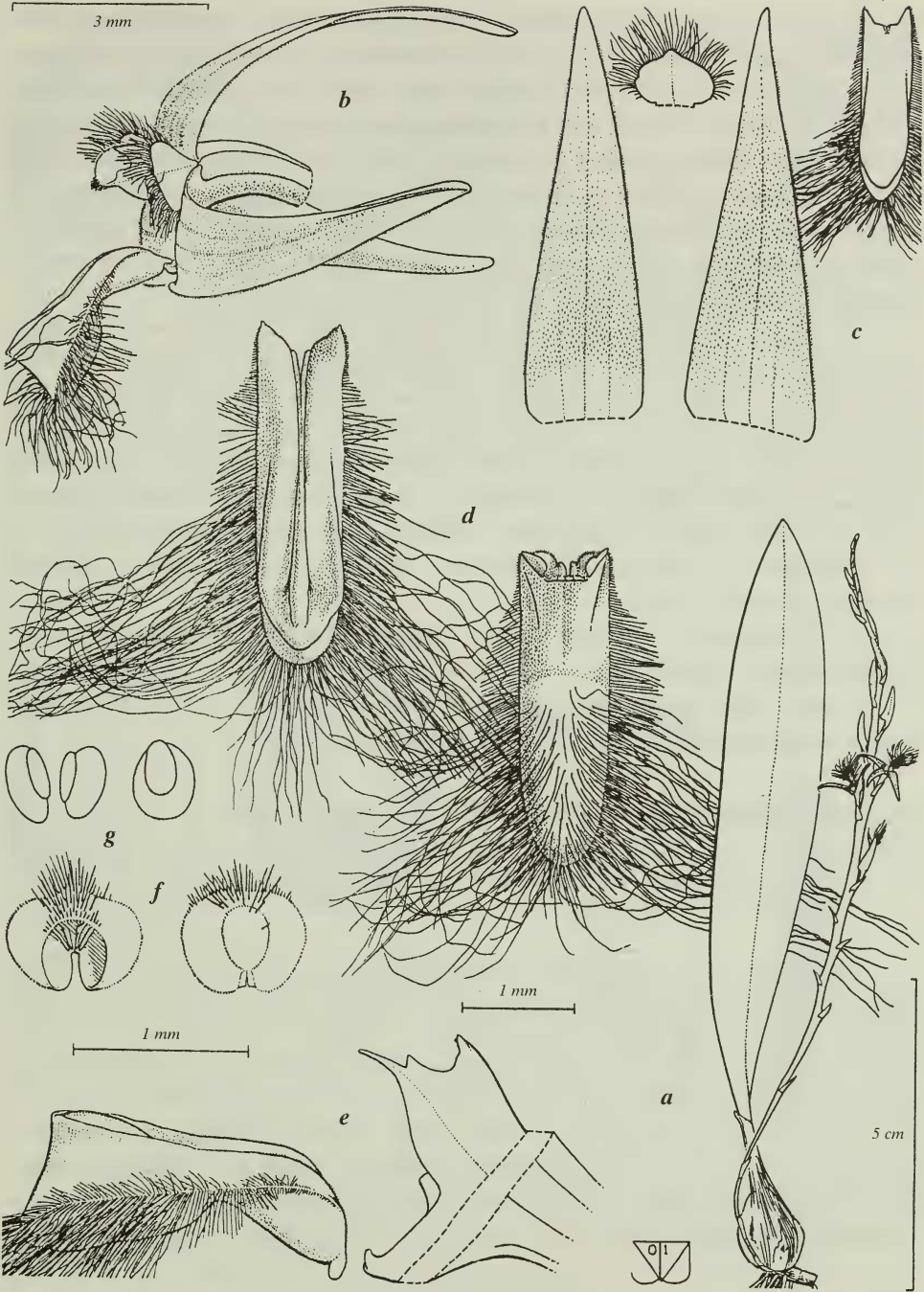


Figure 20. *Bulbophyllum lanuginosum* J.J. Verm. (130)

median slit near the base, with two weak, obtuse ridges that are proximally diverging and running parallel and close to the median line up to near the tip, adaxial surface glabrous; abaxially with a wide, retuse ridge and glabrous towards the base, convex and papillose-hirsute towards the tip. *Column* c. 1.5 mm long, stigma slightly protruding at its base, column foot abaxially without a spur near the tip. *Stelidia* c. 0.6 mm long, acute, $\pm$ rectangular in outline with a distinct, antrorse, deltoid, obtuse to acute tooth along the upper margin and often along the lower margin. *Anther*: front margin papillose with elongated papillae, abaxial ridge $\pm$ glabrous.

Colours: Peduncle dark green at the base, blotched with maroon towards the tip, rhachis brownish or dark maroon, almost black. Flowers yellowish or cream coloured near the base, whitish towards the tip, sepals with partially or entirely blackish purple veins and margins, the lateral sometimes with large blackish purple spots instead of coloured veins; petals without blackish markings. Lip blackish towards the tip, white towards the base, with fine red spots adaxially. Column and anther creamy white.

Habitat & ecology: Epiphyte in montane forest. Alt. c. 1000 m. Flowering in Mar, Nov.

Distribution: MALAYSIA: Peninsula (2 specimens seen). INDONESIA: Sumatra (2).

Notes: Specimens from Peninsular Malaysia with wider leaves than in the description above have been seen in cultivation.

132. *Bulbophyllum groeneveldtii* J.J. Sm. – Fig. 22, plate 15.

Bulbophyllum groeneveldtii J.J. Sm., Bull. Jard. Bot. Buitenzorg, s. 3, 2 (1920) 95. – TYPE: Indonesia, Sumatra, Padang Highlands, *Jacobson cult.* 951 (*leg. Groeneveldt*) (BO, holo).

Rhizome c. 3 mm diam., sections between pseudobulbs c. 0.4 cm long. *Pseudobulbs* touching, (depressed) globose, 0.4–0.7 x 0.4–1.2 cm. *Petiole* 0.3–0.5 cm. *Leaf blade* elliptic to obovate, 8–28 x 0.8–3.3 cm, index (length/width) 8.3–12.5; obtuse. *Inflorescence* an elongated, lax raceme, entirely pendulous, 7–18 cm, up to 45-flowered. *Peduncle* 4–7 cm, bracts c. 4, the longest c. 2 mm long. *Rhachis* swollen, $\pm$ circular in section, 3.5–12 x 0.2–0.3 cm, papillose-hirsute, to the very tip with flowers. *Floral bracts* triangular, c. 1.5 x 1 mm, acute. *Flowers* not much opening, a few simultaneously. *Pedicel* and *ovary* 1.5–2.6 mm long, papillose-hirsute,

Figure 21. *Bulbophyllum atratum* J.J. Sm. (131) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, above: two pairs, below: single pair. – All from *Hort. Singapore SBG-O 87* (spirit sample).

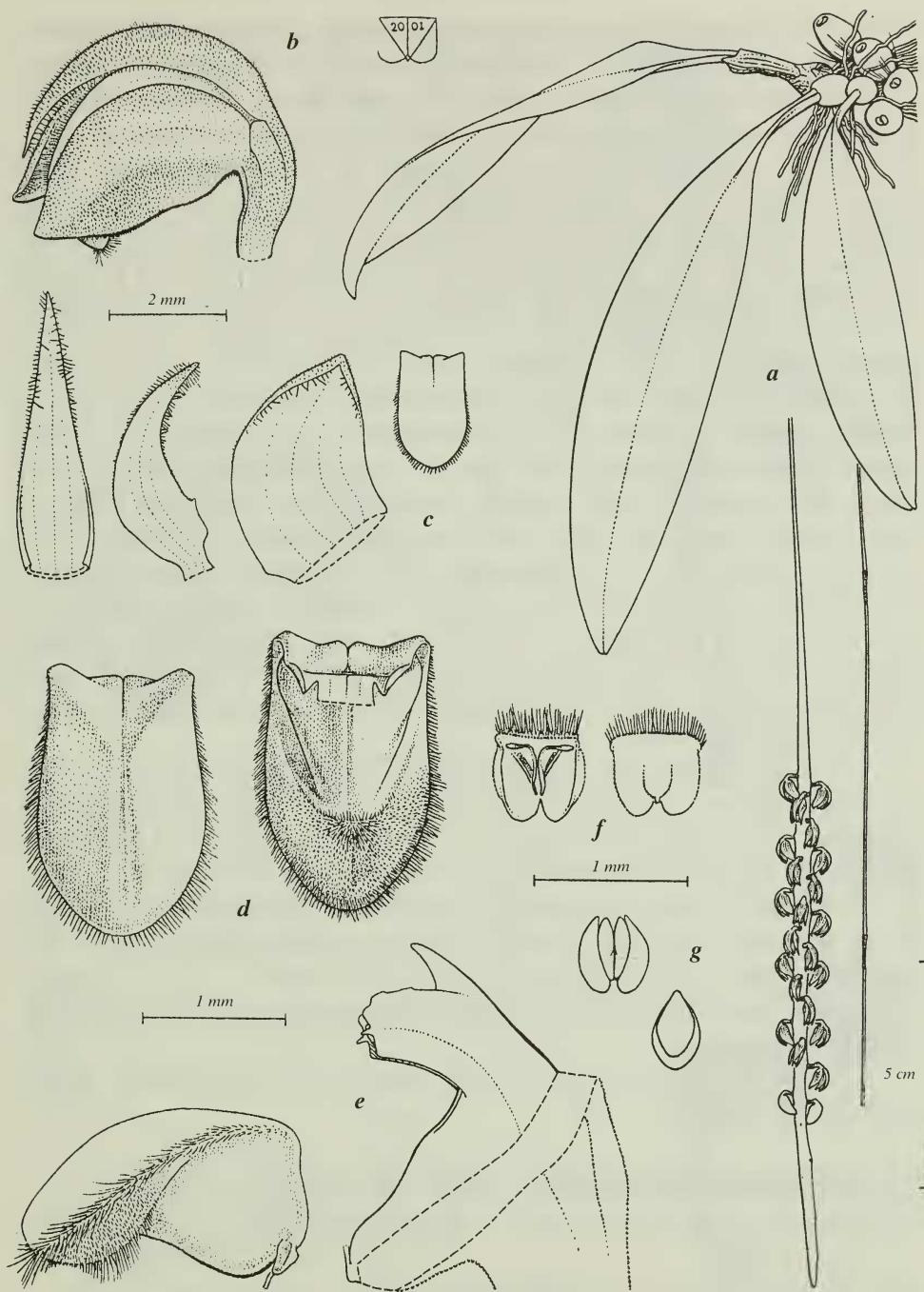


Figure 21. *Bulbophyllum atratum* J.J. Sm. (131)

basal node $\pm$ flush with the surface of the rhachis. *Median sepal* $\pm$ porrect, triangular, 3.2—3.3 x 1.3—1.5 mm, index 2.1—2.5; acute, margins papillose-hirsute, base rather broadly attached; rather thick, surface adaxially glabrous, abaxially papillose-hirsute. *Lateral sepals* slightly recurved, 3.3—3.5 x 2.2—3 mm, index 1.1—1.5; otherwise as the median sepal. *Petals* porrect, falcate or not, hastate with an ovate, acute top part with ciliate margins, and a triangular, acute tooth along upper and lower margin, near the base; 1.6—2.2 x 1.2—1.5 mm, index 1—1.8, base rather broadly attached; rather thin, surface glabrous. *Lip* abruptly recurved in the basal half, elliptic, 2—2.4 x 0.9—1.5 mm, index 1.6—2.2; rounded, margins ciliate in the proximal third; very thick; adaxially not concave and with a short median slit near the base, with two weak, obtuse ridges proximally diverging, and running parallel and close to the median line up to near the tip, adaxial surface glabrous but hirsute near the base and in the top half; abaxially with a wide, rounded ridge towards the base, convex and with scattered coarse hairs towards the tip, surface otherwise glabrous. *Column* 1—1.3 mm long, stigma with an inconspicuous, rounded callus at its base, column foot with two inconspicuous wings distally, abaxially without a spur near the tip. *Stelidia* $\pm$ triangular, c. 0.6 mm long, acute, with 2 small, antrorse, deltoid, acute teeth along the upper margin and 1 $\pm$ similar tooth along their lower margin. *Anther*: front margin papillose with elongated papillae, abaxial ridge $\pm$ glabrous.

Colours: Flowers yellow or pale green, sepals and petals with partially or entirely brown or blackish purple veins and margins, sometimes with additional spots; petals with brown or blackish purple cilia. Lip entirely blackish, or blackish towards the tip only, except for the midvein.

Habitat & ecology: Understorey epiphyte in high montane forest and in low and open *kerangas* forest. Rooting in small humus deposits and moss. Alt. 1100—1300 m. Flowering in Jan, Oct—Dec.

Distribution: MALAYSIA: Sabah (4 specimens seen). INDONESIA: Sumatra (1).

Notes: When sterile, it is characterised by the pendulous, almost strap-shaped leaves.

133. *Bulbophyllum grotianum* J.J. Verm., *sp. nov.* – Fig. 23, plate 16, 17.

Bulbophyllum grotianum J.J. Verm., a *Bulbophyllo atrato* et *B. groeneveldtii*

Figure 22. *Bulbophyllum groeneveldtii* J.J. Sm. (132) — a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, left: two pairs, right: single pair. – All from Vermeulen 1107 (living plant).

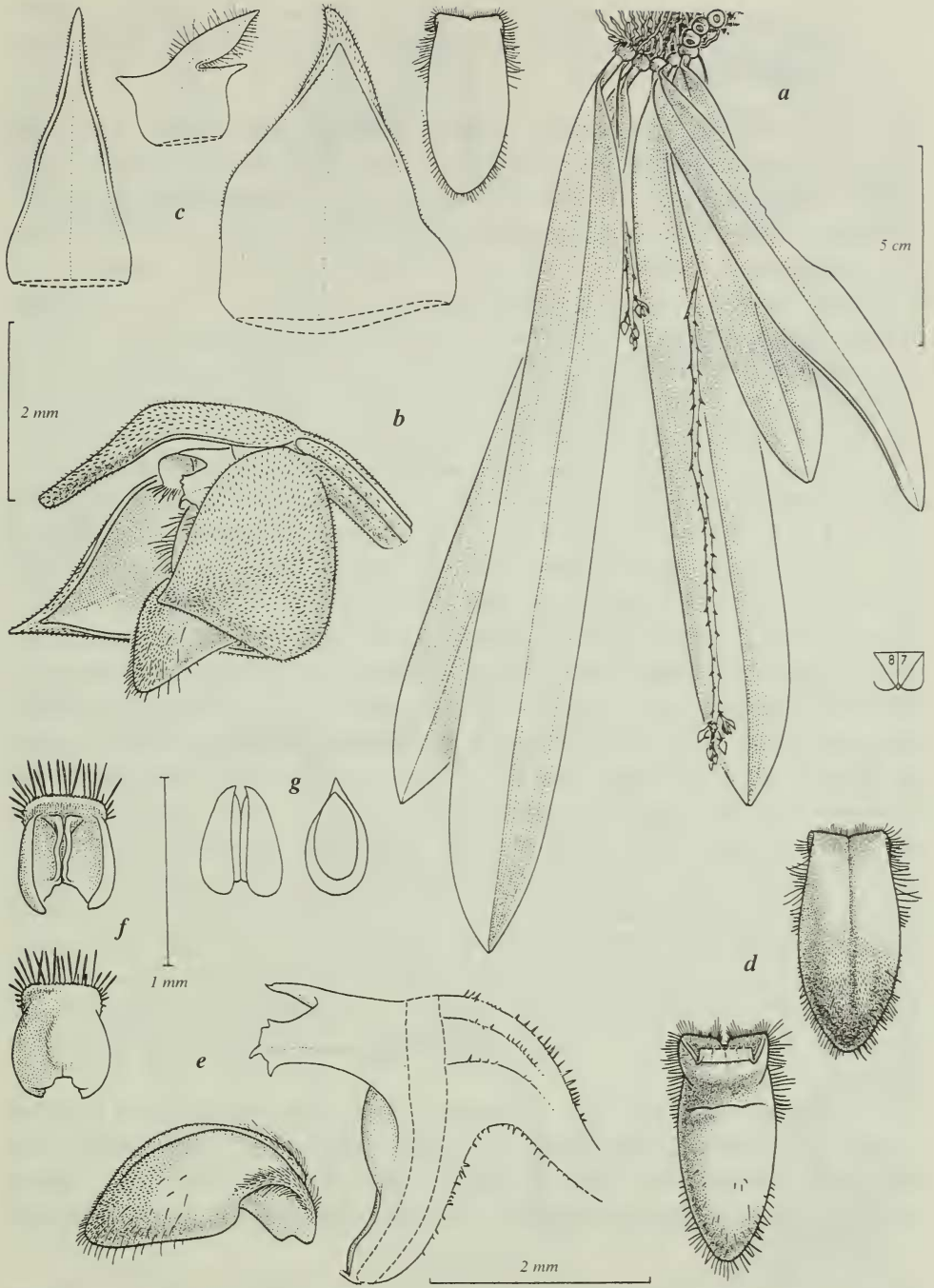


Figure 22. *Bulbophyllum groeneveldtii* J.J. Sm. (132)

inflorescentia erecta, rhachide nutanti 0.6—0.7 cm crassa differt. – TYPE: Malaysia, Sarawak, G. Mulu area, G. Pala near Batu Bulang, *Hort. Leiden* 970530 (L. holo.).

Rhizome 4—5 mm diam., sections between pseudobulbs 0.4—1 cm long. *Pseudobulbs* touching, ovoid, 0.4—0.8 x 0.4—0.8 cm. *Petiole* 1.2—2.2 cm. *Leaf blade* elliptic, 8—16.5 x 2.8—3 cm, index (length/width) 2.3—5.7; rounded. *Inflorescence* an elongated, rather dense raceme, 17.5—23.5 cm, 45—65-flowered. *Peduncle* ± erect, 13—16 cm; bracts c. 4, the longest c. 5.5 mm long. *Rhachis* nodding, spindle-shaped, 4.5—7.5 x 0.6—0.7 cm, papillose-hirsute, to the very tip with flowers. *Floral bracts* triangular, 0.9—1.3 x c. 1 mm, cuspidate. *Flowers* not much opening, several simultaneously. *Pedicel* and *ovary* 1.8—2 mm long, hirsute, basal node ± flush with the surface of the rhachis. *Median sepal* ± porrect, triangular, 3—3.4 x 1.2—1.9 mm, index 1.7—2.5; acute, margins ciliate, base rather broadly attached; rather thick, surface adaxially glabrous, abaxially hirsute. *Lateral sepals* slightly recurved, 3—3.2 x 2.2—2.5 mm, index 1.2—1.4, acuminate-cuspidate, otherwise as the median sepal. *Petals* porrect, ovate-subhastate with an inconspicuous, deltoid, acute tooth along upper and lower margin, 2.2—2.8 x 0.7—1 mm, index 2.8—3.2; acute, margins ciliate except near the base, base rather broadly attached; rather thin, surface glabrous. *Lip* abruptly recurved c. half-way, obovate, 1.6—1.8 x 1.1—1.3 mm, index 1.3—1.5; broadly rounded, margins ciliate; very thick; adaxially somewhat concave and with a short median slit near the base, with two weak, rounded ridges starting in the proximal half and slightly diverging close to the tip, with a small cavity in between, adaxial surface glabrous but very finely papillose towards the base; abaxially with a wide, retuse ridge towards the base, convex towards the tip, surface glabrous. *Column* 1—1.2 mm long, column foot abaxially without a spur near the tip. *Stelidia* ± triangular, 0.4—0.5 mm long, acute, with an antrorse, minute, triangular, acute tooth along the upper margin, and 2 larger, narrowly triangular, acute teeth along the lower margin, the proximal falcate. *Anther*: front margin ciliate, abaxial ridge somewhat papillose.

Colours: Flowers cream-coloured or yellowish, marked with blackish purple: the median sepal along the veins and margins; the lateral sepals also with a blotch near the tip; the lip near the base with dots, the tip entirely blackish purple abaxially. Column and anther cream-coloured.

Figure 23. *Bulbophyllum grotianum* J.J. Verm. (133) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, above: single pair, below: two pairs. – All from *Hort. Leiden* 970530 (spirit sample).

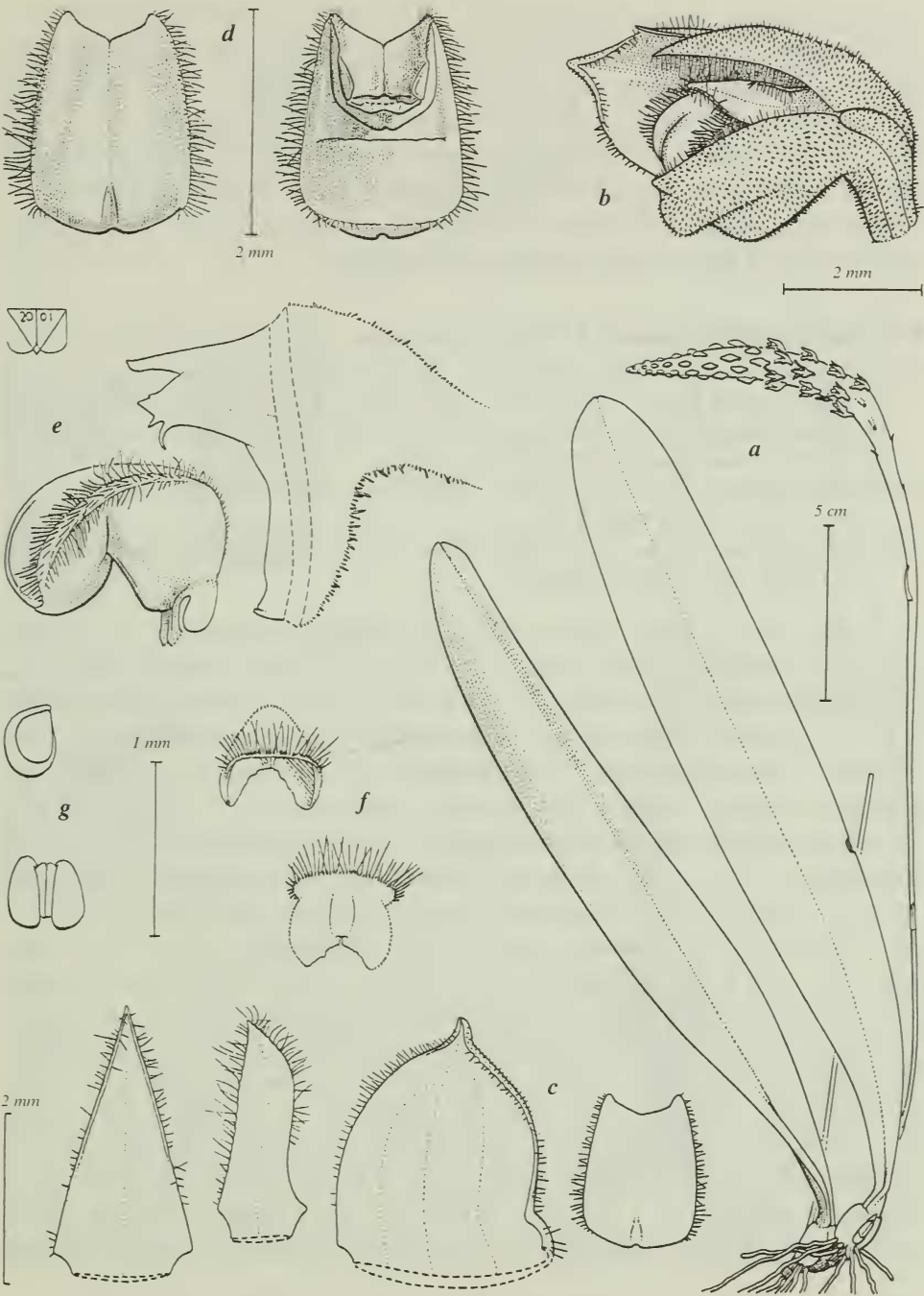


Figure 23. *Bulbophyllum grotianum* J.J. Verm. (133)

spotted maroon. Pollinia yellow.

Habitat & ecology: Epiphyte in forest on a steep limestone hill. Alt.: sea level to 250 m. Flowering in Jul—Sep in cultivation.

Distribution: MALAYSIA: Sarawak (1 specimen seen).

Notes: Differs from *Bulbophyllum atratum* and *B. groeneveldtii* in having an erect inflorescence with a nodding, much thicker rhachis. Named in honour of the late Mr. P.S.J. Groot, Borculo, the Netherlands, an avid orchid grower and friend of thirty years.

134. *Bulbophyllum janus* J.J. Verm., *nom. nov.* – Fig. 24. (*probably extinct*)

Bulbophyllum janus J.J. Verm. – Basionym: *Bulbophyllum platyrrhachis* Ridl., J. Fed. Malay States Mus. 8 (1917) 96. – SYNTYPES: Indonesia, Sumatra, Kerinchi, Siolak Daras, *Robinson & Boden Kloss s.n.* (BM, lecto.); Sumatra, central part, Sarik, Alahan Panjang, *Micholitz s.n.* (K).

[Not *Bulbophyllum platyrrhachis* (Rolfe) Schltr, Bot. Jahrb. Syst. 38 (1905) 15 (= *B. maximum* [Lindl.] Rehb.f.).]

[Not *Bulbophyllum platirhachis* De Wild., Miss. Laur. (1906) 223 (= *B. acutebracteatum* De Wild. var. *acutebracteatum*).]

Rhizome c. 5 mm diam., sections between pseudobulbs 1–1.2 cm long. *Pseudobulbs* ?close, ovoid, 2.2–3 x 1.4–1.8 cm. *Petiole* 6–7.5 cm. *Leaf blade* elliptic to ovate, 16–19 x 4.8–5.5 cm, index (length/width) 3.3–3.5, rounded. *Inflorescence* an elongated, lax raceme, c. 65 cm, c. 100-flowered. *Peduncle* erect, c. 52 cm, bracts c. 5, the longest 23–25 mm long. *Rhachis* nodding, swollen and flattened, elliptic-ovate, c. 12.5 x 1.1 cm, densely papillose, top c. 3 cm with minute, sterile bracts only. *Floral bracts* triangular, 2–2.5 x c. 2 mm, acute. *Flowers* not much opening. *Pedicel* and *ovary* c. 4.5 mm long, with scattered coarse papillae, basal node on a 0.2–0.3 mm-long stump. *Median sepal* porrect, subtriangular, c. 4.3 x 2 mm, index 2.1–2.2; acute, margins shortly ciliolate towards the tip, base broadly attached; rather thick, surface adaxially glabrous but very finely pubescent near the tip, abaxially with scattered, coarse papillae. *Lateral sepals* slightly recurved, ovate, c. 4.3 x 3.8 mm, index 1.1–1.2; subacute, otherwise as the median sepal. *Petals* porrect, falcate, spathulate, c. 3.4 x 1.2 mm, index 2.8–2.9; truncate, margins ciliate, base broadly attached; rather thin; surface glabrous but adaxially hirsute near the tip. *Lip* rather abruptly recurved c. half-way, oblong, c. 3 x 1.9 mm, index 1.5–1.6; rounded, margins ciliate with the longest hairs about half-way up the lip; very thick; adaxially concave

Figure 24. *Bulbophyllum janus* J.J. Verm. (134) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: abaxial side, right: adaxial side; e. Column and lip, lateral view. – a (plant)—e. From *Robinson & Boden Kloss s.n.*; a (inflorescence). From *Micholitz s.n.* (all herbarium specimens).



Figure 24. *Bulbophyllum janus* J.J. Verm. (134)

and with a basal callus continuing up to c. half-way up the lip and with a short median slit near the base, with 2 distinct, rounded ridges diverging proximally and continuing over c. 2/3 of the length of the lip, adaxial surface finely hirsute; abaxially with a wide, rounded ridge towards the base, convex towards the tip, surface glabrous towards the base and finely hirsute towards the tip. *Column* c. 2.3 mm long, stigma with a retuse callus at its base, column foot abaxially without a spur near the tip. *Stelidia* $\pm$ triangular, c. 0.6 mm long, obtuse, with a small, antrorse, obtuse tooth along the upper margin, and a larger, triangular tooth along the lower margin, near the base.

Colours: Rhachis greenish. Flowers yellow.

Habitat & ecology: Alt. 600–1000 m. Flowering observed in Mar.

Distribution: INDONESIA: Sumatra (2 specimen seen). Not collected since 1914.

Notes: The name *platyrrhachis* is sufficiently close to *platyrhachis* and *platirhachis* to warrant a new name, following ICBN 2000, art. 53.3.

The material available does not allow detailed description of the development of the inflorescence during anthesis. According to the original description the rhachis is 5 cm wide. The only rhachis available (*Micholitz s.n.*, syntype) is, dry, 1.1 cm wide. Allowing for shrivelling, the reconstructed width would be c. 1.5 cm, as drawn in fig. 24. The width given in the original description is probably a typographical error.

The name refers to the two-sided rhachis.

135. *Bulbophyllum xiphion* J.J. Verm. – Fig. 25, plate 18, 19.

Bulbophyllum xiphion J.J. Verm., *Blumea* 41 (1996) 354. – TYPE: Indonesia, Kalimantan Timur, Apo Kayan, Gunung Sungei Pandan area, *Hort. Leiden* 913241 (L, holo.).

Rhizome 5–6 mm diam., sections between pseudobulbs 0.9–1.5 cm long. *Pseudobulbs* (almost) touching, ovoid, 1–1.6 x 1–1.6 cm. *Petiole* 4–6 cm. *Leaf blade* elliptic to obovate, 20–24 x 5–6.5 cm, index (length/width) 3.5–4; rounded to obtuse. *Inflorescence* an elongated, lax raceme, c. 42 cm, 60–70-flowered. *Peduncle* patent, c. 28 cm, bracts c. 4, the longest c. 16 mm long. *Rhachis* nodding, swollen and flattened, elliptic-ovate, 11–15 x 1.2–1.5 x 0.6–0.8 cm, finely rugose-papillose, top 3.5 cm with minute, sterile bracts only. *Floral bracts* deltoid to triangular, 0.5–1.2 x 0.9–1.2

Figure 25. *Bulbophyllum xiphion* J.J. Verm. (135) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, above: two pairs, below: single pair. – All from *Hort. Leiden* 913241 (spirit sample).

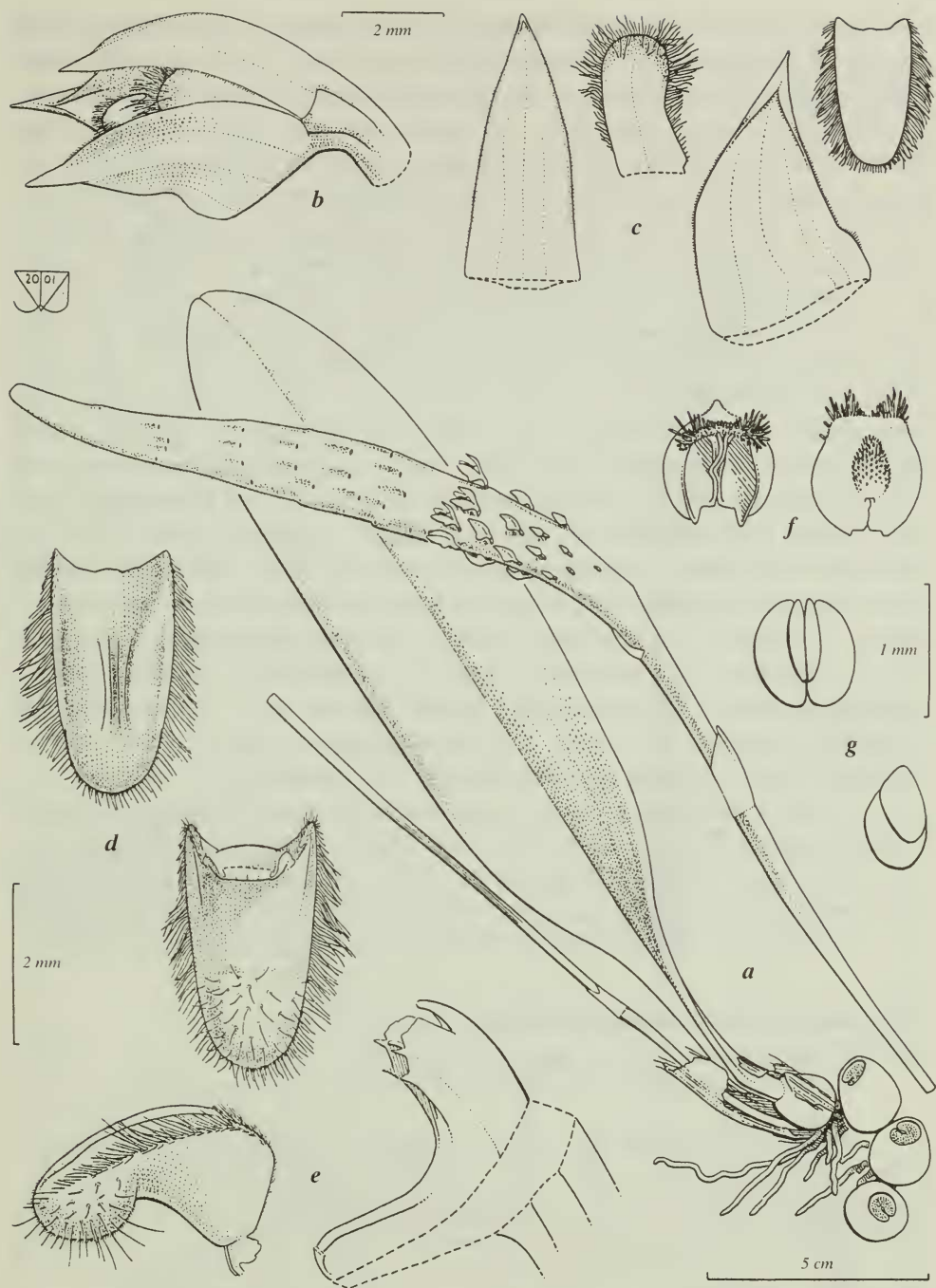


Figure 25. *Bulbophyllum xiphion* J.J. Verm. (135)

mm, acute. *Flowers* not much opening, a few simultaneously, anthesis from the top of the rhachis downwards. *Pedicel* and *ovary* 2—2.4 mm long, basal node $\pm$ flush with the surface of the rhachis. *Median sepal* porrect, triangular, 5—5.5 x 2—2.4 mm, index 2.3—2.5; acute, margins shortly ciliolate, base broadly attached; thick, surface adaxially very finely papillose towards the margins, abaxially glabrous. *Lateral sepals* slightly recurved, slightly falcate, 5.5—6.2 x 3.2—3.5 mm, index 1.7—1.8; acuminate, adaxially glabrous, otherwise as the median sepal. *Petals* porrect, obovate to elliptic, 3—3.2 x c. 1.5 mm, index 2—2.2; rounded, margins long ciliate except near the base, base broadly attached; thin, adaxially very finely papillose and with some long hairs towards the tip, abaxially glabrous. *Lip* rather abruptly recurved c. half-way, ovate, c. 3 x 1.7 mm, index 1.4—1.5; rounded, margins long ciliate with the longest hairs about half-way up the lip; very thick; adaxially somewhat concave near the base, with 2 inconspicuous, rounded ridges diverging proximally and continuing over c. 2/3 of the length of the lip, adaxial surface glabrous but very finely papillose towards the tip; abaxially with a wide, truncate ridge towards the base, convex towards the tip, surface glabrous but with scattered hairs implanted in tiny pits towards the tip. *Column* 2—2.2 mm long, column foot abaxially without a spur near the tip. *Stelidia* c. 0.6 mm long, acute, $\pm$ rectangular in outline with an antrorse, truncate wing along the upper margin, and a small, narrowly triangular, acute tooth along the lower margin. *Anther*: front margin papillose with elongated papillae, abaxial ridge papillose.

Colours: Rhachis yellowish green, either spotted with bronze purple or not. Sepals off-white, adaxially spotted with purple. Lip purple.

Habitat & ecology: Epiphyte in primary forest on a ridge and on a tree overhanging a river. Alt. 650—1050 m. Flowering observed in Oct.

Distribution: INDONESIA: Kalimantan Timur (2 specimen seen).

136. *Bulbophyllum mirabile* Hallier – Fig. 26, 27, plate 20, 21.

Bulbophyllum mirabile Hallier., Ann. Jard. Bot. Buitenzorg 13 (1896) 316. – TYPE: West Kalimantan. Hort. Bogor (Leg. Jaheri) (BO, holo., not seen).

Pseudobulbs touching, ovoid-conical, 2.5—3 x 1.5—2 cm. *Petiole* 3—5 cm. *Leaf blade* elliptic, 19—20 x 7.4—8.5 cm, index (length/width) 2.3—2.6; rounded. *Inflorescence* an elongated, lax raceme, entirely pendulous, 11.3—29 cm, 75—120-flowered. *Peduncle* 2—9 cm, bracts 2—3, the longest

Figure 26. *Bulbophyllum mirabile* Hallier. (136) – a. Habit; b. Flowers, above: from the basal part of the rhachis, below: from the top part of the rhachis; c. Flower analysis, flower from the basal part of the rhachis, from left to right: median sepal, petal, lateral sepal, lip; d. Flower analysis, flower from the top part of the rhachis, from left to right: median sepal, petal, lateral sepal, lip. – All from *Jongejan cult. 4031* (spirit sample).

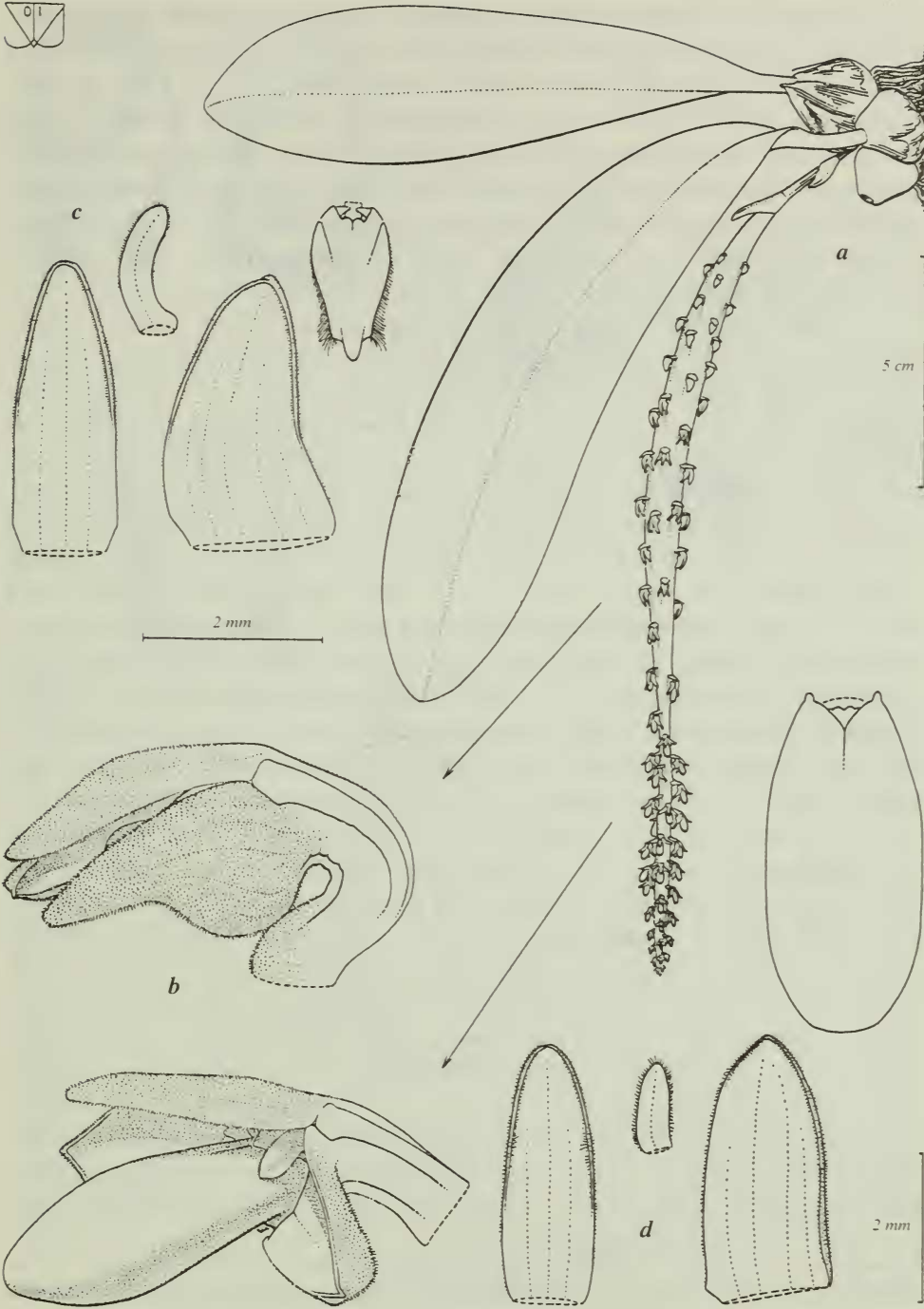


Figure 26. *Bulbophyllum mirabile* Hallier. (136)

11—13 mm long. *Rhachis* slightly papillose, basal part spindle-shaped, 4—10.5 x 0.7—0.8 cm, gradually tapering into a cylindrical top part of 4.3—14 x 0.3—0.45 cm. *Floral bracts* ovate to triangular, 2—2.5 x 12—2 mm, (sub)acute. *Flowers* many open simultaneously, dimorphic, flowers along the basal part of the rhachis different from those along the top part, anthesis starting at the transition between the two types, continuing upwards and downwards. *Flowers along the basal part of the rhachis* not much opening. *Pedicel* and *ovary* 2—3 mm long, locally papillose-hirsute, basal node $\pm$ flush with the surface of the rhachis. *Median sepal* $\pm$ porrect, ovate, 3—5 x 1.1—1.8 mm, index 2.3—3.4; obtuse, margins ciliate, base rather broadly attached; rather thick, surface adaxially glabrous, abaxially papillose-hirsute. *Lateral sepals* slightly recurved, slightly falcate, 2.7—5 x 2—3 mm, index 1.2—1.7; otherwise as the median sepal. *Petals* porrect, falcate, elliptic to ovate, 1.3—3.5 x 0.3—0.9 mm, index 3.2—5; obtuse, margins ciliate, base broadly attached; rather thick with a very thick top, surface glabrous, adaxially sometimes hirsute towards the tip. *Lip* (rather abruptly) recurved c. half-way, ovate, 1.8—2.3 x 0.9—1.3 mm, index 1.7—2; rounded, margins ciliate with the cilia longest near the tip; very thick; adaxially concave and with 1—2 basal calli sometimes continuing up to c. half-way up the lip and with a short median slit near the base, with two distinct ridges diverging proximally, continuing over $1/2$ — $4/5$ of the lip and distally fused to a wide, rounded or flat median ridge overtopping the tip of the lip, adaxial surface glabrous, distally sometimes verrucose along the median line; abaxially with a wide, rounded to truncate, glabrous to papillose ridge towards the base, convex and hairy towards the tip; basal auricles sometimes inconspicuous. *Column* 1.1—1.8 mm long, stigma with two small, obtuse lateral teeth near its base, column foot abaxially without a spur near the tip. *Stelidia* 0.4—0.5 mm long, acute, $\pm$ rectangular in outline with an antrorse, deltoid, obtuse to acute tooth along their upper margin and a similar but often patent tooth along their lower margin. *Anther*: front margin ciliate, abaxial ridge $\pm$ glabrous. *Flowers along the top part of the rhachis* similar, but opening wide. *Pedicel* and *ovary* 0.5—1.5 mm long. *Median sepal* somewhat recurved, 3.3—4.2 x 1.2—1.3 mm, index 2.5—3.5. *Lateral sepals* spreading, 3.4—4.8 x 1.8—2.2 mm, index 1.8—2.2; otherwise as the median sepal. *Petals* 1.3—2.2 x c. 0.5 mm, index 2.6—4.4. *Lip* recurved near the base, elliptic, 3—4.2 x 1.5—2 mm, index 2.1—2.5; margins ciliate near

Figure 27. *Bulbophyllum mirabile* Hallier. (136) – Flower from the basal part of the rhachis: a. Lip, left: adaxial side, right: abaxial side; b. Lip, adaxial side; c. Column and lip, lateral view; d. Anther, left: adaxial side, right: abaxial side; e. Pollinia, left: single pair, right: two pairs. – Flower from the top part of the rhachis: f. Lip, left: adaxial side, right: abaxial side; g. Column and lip, lateral view. – b. From *Bogor comm.* 153; a, c—g. From *Jongejan cult.* 4031 (both spirit samples).

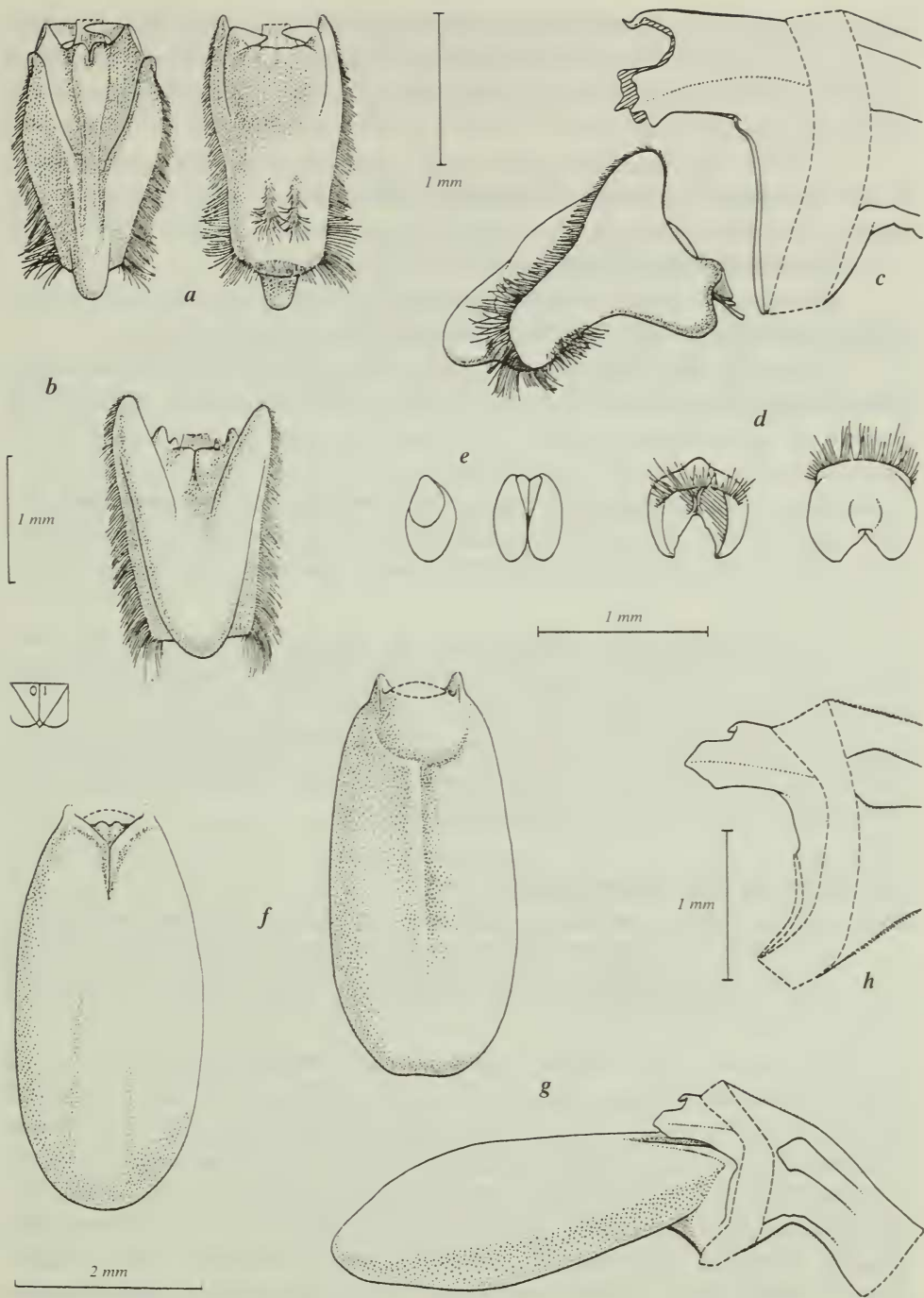


Figure 27. *Bulbophyllum mirabile* Hallier. (136)

the base, elsewhere glabrous to sparsely ciliate, surface glabrous; adaxially slightly concave and with two calli near the base, convex beyond two short ridges together forming a 'v'; abaxially with a rounded ridge near the base, convex towards the tip.

Colours: Rhachis and sepals pale greenish with pale purple dots. Petals translucent whitish or yellowish, with purple dots and cilia. Lip whitish, adaxially suffused with reddish purple, hairs purple.

Habitat & ecology: Epiphyte. Alt. 200—300 m.

Distribution: MALAYSIA: Peninsula (1 specimen seen, a doubtful record, see below). BRUNEI (1). INDONESIA: Kalimantan (1).

Notes: The only *Bulbophyllum* with dimorphic flowers. The two forms occupy separate parts of the rhachis: a short transitional area carries a few flowers of intermediate shape. The flowers along the basal part of the rhachis seem to be fertile; those along the top part often (not always) have a malformed and incomplete column with neither pollinia nor stigma. In such flowers, the lip and the petals may be immovably fused with the column. Near the tip of the rhachis the flowers gradually but conspicuously decrease in size.

The specimen *Hort. Glasnevin s.n.* is marked 'Malaya'. In the past, this was used for what is now Peninsular Malaysia, but the species has not been collected there since. The record is considered doubtful. In spite of having been in cultivation on three independent occasions, no vegetative parts have been preserved except for one leaf. Details have been copied from Hallier's original description.

137. *Bulbophyllum spadiceflorum* Tixier

Bulbophyllum spadiceflorum Tixier, *Adansonia* 6 (1966) 449, incl. **line drawing**: Tran Hop, *Orch. Vietnam* (1998) 126. **colour photograph 33**. — *Osyricera spadiceflora* (Tixier) Garay, Hamer & Siegerist, *Nordic J. Bot.* 14 (1994) 643. — **TYPE**: Vietnam, Quang Duc, piste de Fyan, *Hort. Paris* 174/65 (P, holo., not seen).

Rhizome c. 8 mm diam., sections between pseudobulbs 1.5—2 cm long. **Pseudobulbs** distant, ovoid, c. 1.2 x 1 cm. **Petiole** c. 2 cm. **Leaf blade** elliptic to obovate, c. 25 x 2.5—3 cm, index (length/width) 8.3—10; obtuse. **Inflorescence** an elongated, lax raceme, c. 50 cm. **Peduncle** erect to patent, c. 30 cm, bracts c. 5, the longest c. 20 mm long. **Rhachis** nodding, swollen, $\pm$ circular in section, c. 20 x 0.5—0.6 cm. **Floral bracts** c. 2 mm long, acuminate. **Flowers**: anthesis from the top of the rhachis downwards. **Median sepal** porrect, triangular, c. 4 x 0.8 mm, index c. 5, margins ciliate. **Lateral sepals** c. 4 x 2 mm, index c. 2; acuminate. **Petals** porrect, obovate, c. 1.6 x 0.6 mm, index c. 2.7; rounded, margins ciliate except near the base, base rather narrowly attached. **Lip** recurved in the proximal half, obovate, c. 3.5 mm

long, rounded, margins with long hairs towards the tip; adaxially somewhat concave near the base, without a median ridge, surface papillose; abaxial surface glabrous. *Column* c. 1.7 mm long, column foot abaxially without a spur near the tip. *Stelidia* obtuse. *Anther*: front margin ciliate, abaxially papillose.

Colours: Rhachis green. Sepals and petals yellowish green with purple veins. Lip purple.

Habitat & ecology: Alt. 500—1000 m. Flowering observed in May.

Distribution: VIETNAM: Central part.

Notes: No material available, although the species has been found again recently (Tran Hop, 1998). The type could not be found in P. The information above has been compiled from Tixier's description and illustration.

138. *Bulbophyllum polycyclum* J.J. Verm. – Fig. 28, plate 22.

Bulbophyllum polycyclum J.J. Verm., Blumea 41 (1996) 351. – TYPE: Indonesia, Kalimantan Timur, Apo Kayan, Gunung Sungei Pendan area, *Hort. Leiden* 913457 (L. holo.).

Rhizome 3—4 mm diam., sections between pseudobulbs 0.9—1.2 cm long. *Pseudobulbs* touching, ovoid to depressed-conical, 1.2—1.5 x 1.3—1.8 cm. *Petiole* 3—4 cm. *Leaf blade* elliptic to ovate, 12.5—16 x 4.5—6.5 cm, index (length/width) 2.2—2.4; obtuse. *Inflorescence* an elongated, rather lax raceme with the flowers spirally arranged towards the base of the inflorescence, arranged in often imperfect whorls of 5—8 or in interrupted spirals towards the tip, entirely pendulous, 50—75 cm, 70—90-flowered. *Peduncle* 17—40 cm, bracts 5—6, the longest 8—10 mm long. *Rhachis* swollen, $\pm$ circular in section, with the flowers on low-conical protuberances, 33—36 x 0.3—0.4 cm, $\pm$ glabrous. *Floral bracts* triangular, 1.2—1.5 x 1—1.3 mm, acute. *Flowers* not much opening, a few simultaneously. *Pedicel* and *ovary* 2.2—3 mm long, basal node on a c. 0.5 mm-long stump. *Median sepal* $\pm$ porrect, triangular, 3.6—4.5 x 1.5—2 mm, index 1.9—2.7; obtuse, margins very finely papillose, base rather narrowly attached; rather thick, surface adaxially glabrous, abaxially very finely papillose-hirsute. *Lateral sepals* slightly recurved, 3.3—4 x 2.5—3 mm, index 1.2—1.6; otherwise as the median sepal. *Petals* porrect, ovate to spatulate, with a widened base, 1.9—2 x 0.6—1 mm, index 2—3.2; rounded, margins ciliate, base rather broadly attached; thin, surface glabrous. *Lip* abruptly recurved slightly over half-way, elliptic-obovate, 2.2—2.9 x 1.5—1.8 mm, index 1.5—2. rounded; margins ciliate with the cilia longest c. half-way up the lip; very thick, surface $\pm$ glabrous; adaxially concave and with two weak calli continuing to half-way up the lip as weak ridges near the base, with a

median slit over most of its length ending in a small, circular plug that can be removed and leaving a deep conical pit, with two distinct ridges diverging proximally and continuing over c. 1/2 of the lip, surface distally distinctly convex and overtopping the front margin; abaxially with a wide, truncate ridge towards the base, convex towards the tip. *Column* 1.8—2 mm long, stigma with 2 large lateral calli at its base, column foot swollen, abaxially without a spur near the tip. *Stelidia* falcate, triangular, c. 0.7 mm long, acute, with an antrorse, deltoid, obtuse tooth along their upper margin and a similar but triangular, acute tooth along their lower margin. *Anther*: front margin ciliate, abaxial ridge glabrous.

Colours: Rhachis dark green. Sepals and petals greenish, heavily stained with blackish purple, particularly towards the margins and near the veins. Lip yellowish, stained with blackish purple.

Habitat & ecology: Epiphyte in *kerangas* forest of c. 20 m high, with a mossy floor. Alt. 850—1700 m.

Distribution: MALAYSIA: Sabah (1 specimen seen). INDONESIA: Kalimantan (1).

139. *Bulbophyllum lindleyanum* Griff. – Fig. 29, plate 23.

Bulbophyllum (“*Bolbophyllum*”) *lindleyanum* Griff., Notulae 3 (1851) 287. – *Phyllorchis lindleyana* (Griff.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 677. — TYPE: Myanmar, Mergui, Griffith 697 (not seen).

Bulbophyllum rigens Rchb.f., Hamburger Garten- Blumenzeitung 21 (1865) 296. – *Phyllorchis rigens* (Griff.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 677. — TYPE: locality unknown, *Herb. Reichenbach* 2252 (*Day* 63) (W. holo.).

Bulbophyllum caesariatum Ridl., Bull. Misc. Inform., Kew (1924) 202. – SYNTYPES: Thailand, southwest coast, Kopah Jan-Jan, Haniff & Nur SFN 2702 (SING, lecto.; K, isolecoto., the latter not seen); 2750 (K, not seen).

Rhizome 2.5—3.5 mm diam., sections between pseudobulbs 1.2—2.5 cm long. *Pseudobulbs* touching, ovoid to globose, 1.2—3 x 1—2.5 cm. *Petiole* 1.8—3.5 cm. *Leaf blade* elliptic to ovate, 6—18 x 1.5—3 cm, index (length/width) 4—6.8; acute. *Inflorescence* an elongated, rather lax raceme, 11—28 cm, 9—25-flowered. *Peduncle* erect to patent, 6—19 cm, bracts c. 6, the longest 4.8—13 mm long. *Rhachis* nodding, not thickened, 3.5—10 cm, hispid with short, stiff hairs. *Floral bracts* triangular, 5—8 x 1.2—2.5 mm, acuminate. *Flowers* opening fully, many simultaneously. *Pedicel* and *ovary* 7—11 mm long, hispid as the rhachis, basal node on a 0.3—1 mm-long

Figure 28. *Bulbophyllum polycyclum* J.J. Verm. (138) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, adaxial side; e. Lip, abaxial side; f. Column and lip, lateral view; g. Anther, above: abaxial side, below: adaxial side; h. Pollinia, above: single pair, below: two pairs. – All from *Hort. Leiden* 913457 (spirit sample).

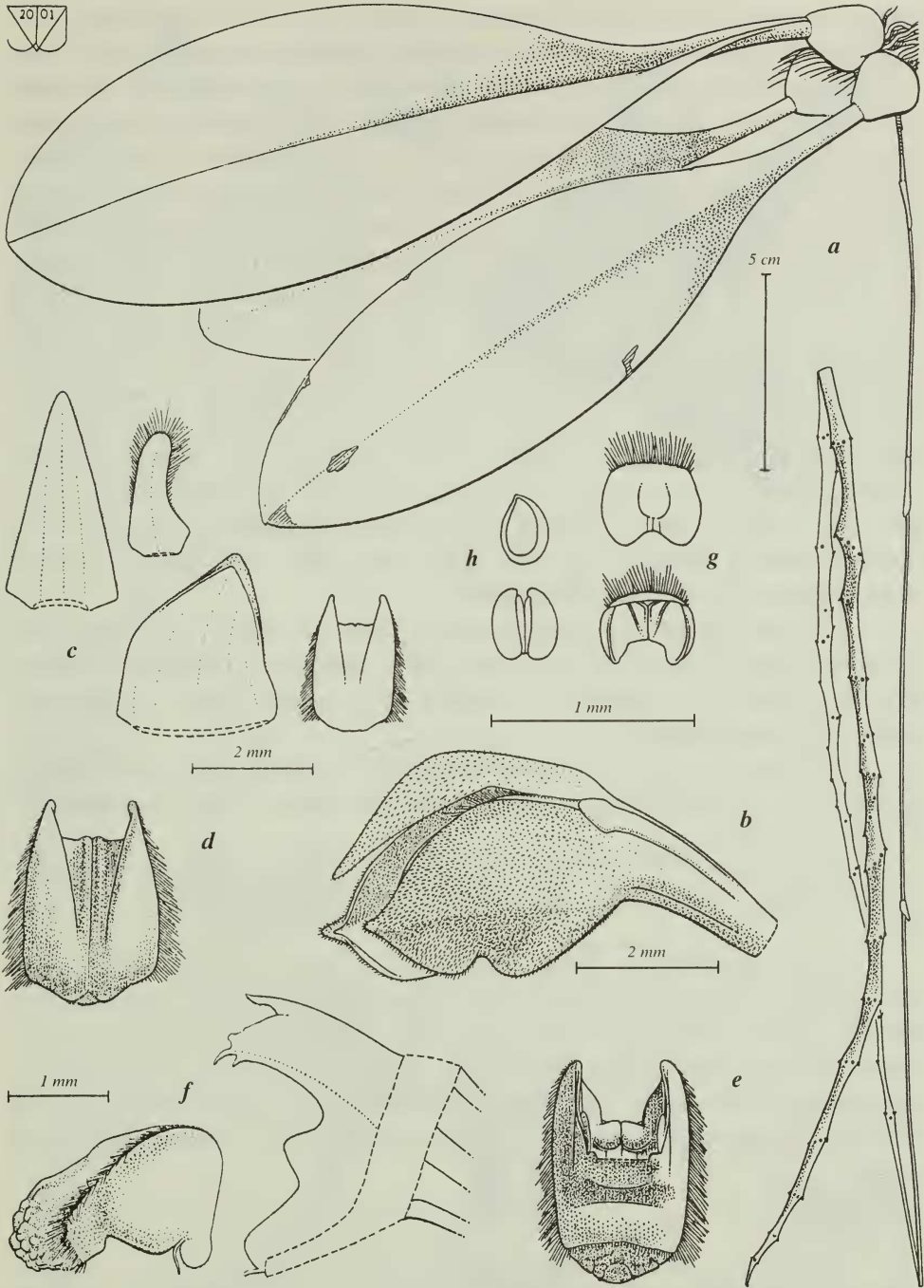


Figure 28. *Bulbophyllum polycyclum* J.J. Verm. (138)

stump. *Median sepal* recurved, ovate, 5.1—6.5 x 2.2—3.5 mm, index 1.7—2.5; acute to acuminate, margins somewhat papillose, sparsely ciliate, base broadly attached; rather thin, surface locally very finely papillose, adaxially pilose with long, thin hairs, abaxially hispid as the rhachis. *Lateral sepals* ovate-triangular, 6—8 x 3—4 mm, index 1.5—2; acuminate, upper margin without cilia; otherwise as the median sepal. *Petals* somewhat recurved, elliptic to ovate, 1.5—2.3 x 1.2—1.5 mm, index 1.1—2; (sub-)acute, margins ciliate, base broadly attached; thin; surface glabrous but abaxially pilose near the tip. *Lip* abruptly recurved slightly below half-way, ovate-oblong, 2—3 x 1.2—1.8 mm, index 1.3—2.1 (all without artificial spreading); rounded, margins ciliate in the distal 2/3; rather thin, surface $\pm$ glabrous; adaxially almost flat proximally, somewhat convex distally; abaxially with a weak, rounded ridge proximally, slightly convex distally; basal auricles absent or inconspicuous. *Column* 2.5—3 mm long, foot slightly swollen. *Stelidia* subulate, 1—1.7 mm long, subacute, finely papillose distally, near the base with a minute, obtuse tooth along their upper margin, and a distinct, deltoid, rounded to obtuse wing along their lower margin. *Anther*: front margin and abaxial side papillose.

Colours: Sepals and petals greenish yellow to white, the sepals with blackish purple to dark brown veins and sometimes a similarly coloured tip, the petals with a similarly coloured or a greenish vein. Lip greenish yellow with greyish hairs.

Habitat & ecology: In forest, also found as an epiphyte in old rubber plantations among limestone hills. A lowland species. Flowering observed in Jan, Nov, Dec.

Distribution: MYANMAR: Moulmein (2 specimens seen); Mergui (*vide* Griffith); 'S part, close to Thai border' (1). THAILAND: Peninsula (6).

Notes: Two sheets: *Herb. Reichenbach (Foerstermann) 15563*, and *Foerstermann 08* (both W) are marked "Sarawak". On the first sheet another locality: "Birma, Bhamo" is also given but crossed out. Foerstermann has collected both in Myanmar (Burma) as well as in Sarawak, nevertheless I assume that both sheets are wrongly labeled because the species has never been found again in Sarawak, and the locality is far outside its known range.

Figure 29. *Bulbophyllum lindleyanum* Griff.(139) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, adaxial side; e. Lip, abaxial side; f. Column and lip, lateral view; g. Anther, left: adaxial side, right: abaxial side; h. Pollinia, above: two pairs, below: single pair. – All from FF 48 (spirit sample).

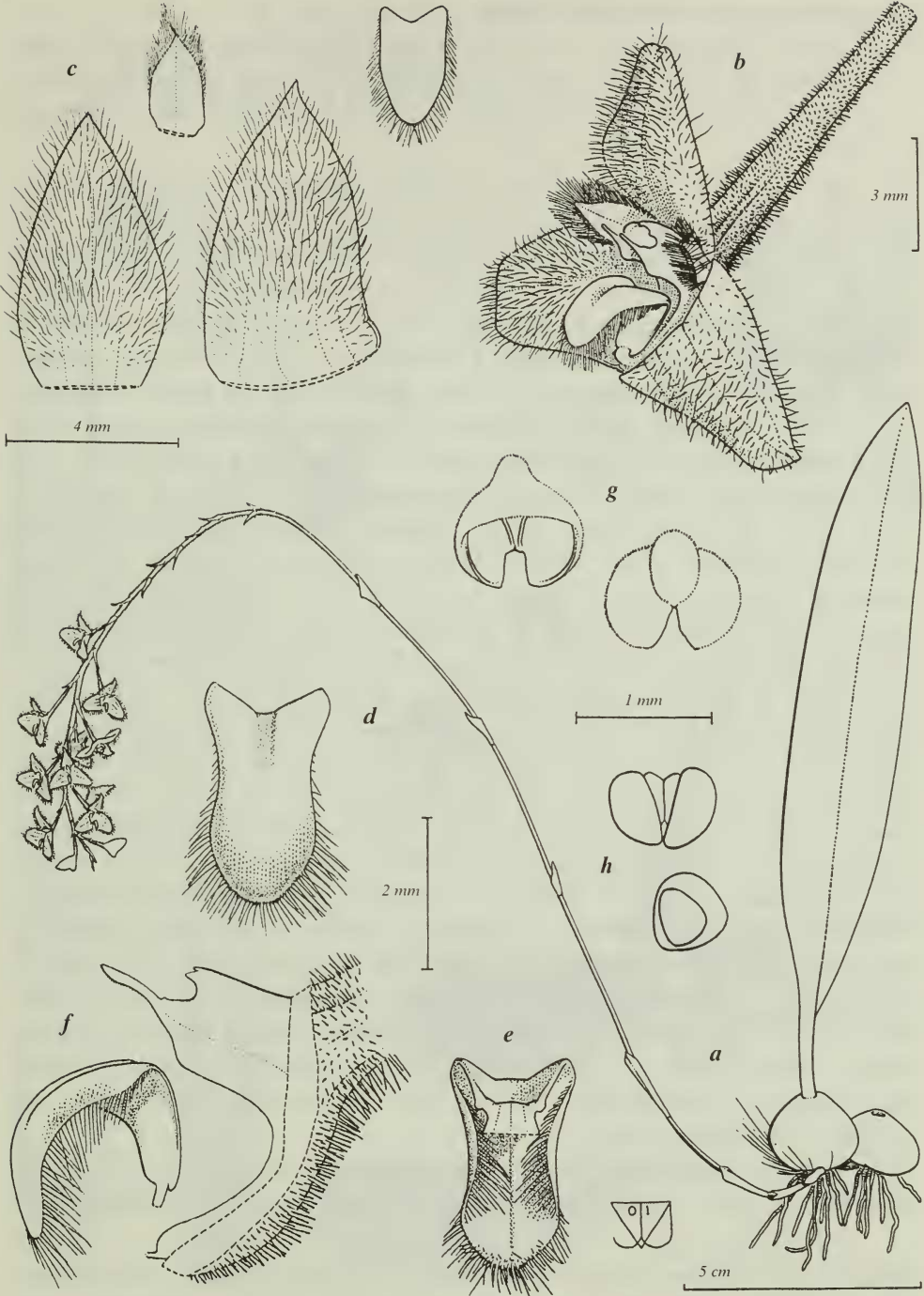


Figure 29. *Bulbophyllum lindleyanum* Griff. (139)

140. *Bulbophyllum tremulum* Wight – Fig. 30, plate 24.

Bulbophyllum ("Bolbophyllum") *tremulum* Wight, Icon. Pl. Ind. or. 5, 1 (1851) t. 1749; Joseph, Rec. Bot. Surv. India 22 (1982) 92. – *Phyllorchis tremula* (Wight) O. Kuntze, Rev. Gen. Pl. 2 (1891) 678. — TYPE: India, Nilgiri Hills, *Jerdon s.n.* (not seen).

Rhizome 1.8–3.2 mm diam., sections between pseudobulbs 1.2–3 cm long. *Pseudobulbs* close or distant, ovoid or low-conical, 0.7–1.5 x 0.8–1.7 cm, surface somewhat corrugated. *Petiole* 0.1–0.7 cm. *Leaf blade* ovate, 2–8.5 x 0.6–1.6 cm, index (length/width) 2.7–4.3; obtuse. *Inflorescence* an elongated, lax raceme, 7–26 cm, 9–13-flowered. *Peduncle* erect to patent, 5–9 cm, bracts 3–4, the longest 4–8.5 mm long. *Rhachis* erect to arching, not thickened, 2–7 cm, glabrous. *Floral bracts* triangular, 1.2–3 x 0.7–1.2 mm, acute. *Flowers* ± distichous, secund, opening wide, many simultaneously. *Pedicel* and *ovary* 7–8 mm long, basal node on a 0.3–0.6 mm-long stump. *Median sepal* spreading to reflexed, triangular, 7–12 x 1.7–2.8 mm, index 3.7–5.5; acute, margins ciliate, base rather narrowly attached; thin, adaxial surface pubescent towards the base, abaxially glabrous. *Lateral sepals* 8–13.5 x 2–4.2 mm, index 2.6–4.5; upper margin sparsely ciliolate; otherwise as the median sepal. *Petals* porrect, elliptic-ovate with a wide base, 1.8–2.6 x 0.8–0.9 mm, index 2–2.9; obtuse to acute, margins ciliate, base broadly attached; thin, surface glabrous but pubescent adaxially near the tip. *Lip* recurved near the base, oblong, 5.5–8 x 1.7–2 mm, index 3.2–4.7; rounded to obtuse, margins ciliate proximally; lip thick, very thick near the base; adaxially somewhat concave and with two calli near the base, with two distinct ridges diverging proximally and continuing parallel and close together over c. 1/2 of the lip, adaxial surface smooth to distinctly verrucose, glabrous; abaxially with a rounded ridge near the base, surface otherwise ± flat, with numerous spindle-shaped hairs arising from tiny pits, surface otherwise glabrous. *Column* 1.5–2 mm long, stigma distinctly protruding at its base. *Stelidia* 0.5–0.7 mm long, obtuse, ± rectangular in outline with an antrorse, deltoid, obtuse tooth along the upper margin, and a deltoid, rounded to obtuse wing along the lower margin. *Anther*: front margin and abaxial ridge with distinct, elongated papillae.

Colours: Sepals and petals yellowish or greenish, veins and margins partially or entirely purple; the petals sometimes entirely suffused with

Figure 30. *Bulbophyllum tremulum* Wight. (140) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, above: single pair, below: two pairs. – All from *Jongejan cult.* 4544 (spirit sample).

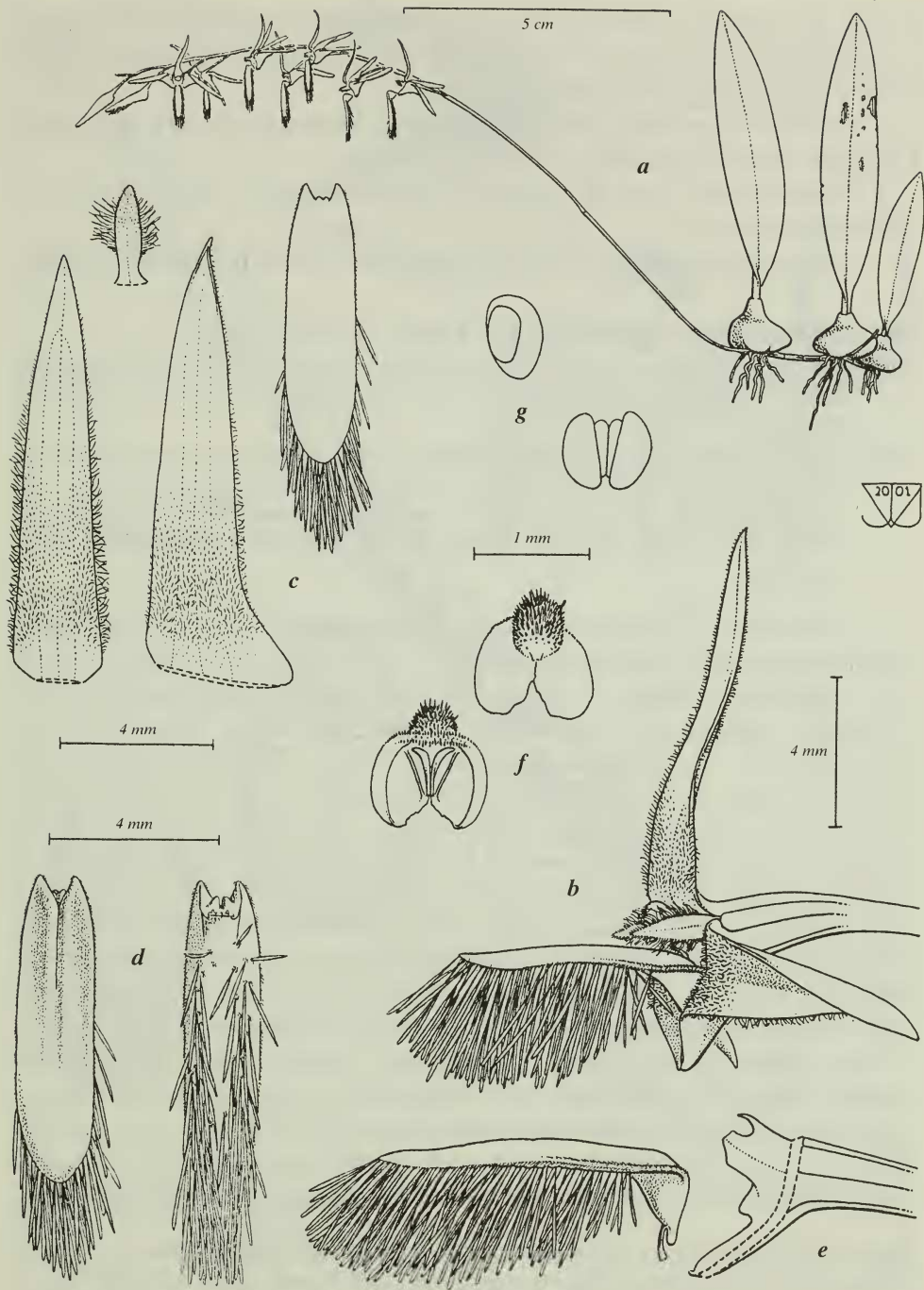


Figure 30. *Bulbophyllum tremulum* Wight (140)

purple. Lip white, yellow or brownish, sometimes suffused with purple near the base, or entirely dark purple. Hairs along the margins white, those on the abaxial side of the lip purple.

Habitat & ecology: Alt. 800—1100 m. Flowering in Jan, Feb, Sep, Dec (Feb, Apr in cultivation).

Distribution: INDIA: south-west part: Nilgiris, Silent Valley (4 specimens seen).

Notes: Data from Joseph (1982) have been included in the description.

141. *Bulbophyllum scaphiforme* J.J. Verm., *sp. nov.* – Fig. 31.

Bulbophyllum scaphiforme J.J. Verm., a *Bulbophyllo nigrescenti* labello marsupiiiformi differt. – TYPE: Thailand, Doi San Yao, *Seidenfaden & Smitinand (GT) 7464* (C, holo.).

Bulbophyllum nigrescens sensu Seidenf. & Smitin., Orch. Thailand 3 (1961) 426 (partly, incl. fig. 319); Seidenf., Dansk Bot. Ark. 33, 3 (1979) 104 (partly, incl. fig. 64); Tran Hop, Orch. Vietnam (1998) 113, **colour photograph 30**; S.C. Chen *et al.*, Native Orch. China (1999) 35 (**upper left and right colour photographs only**), non Rolfe.

Rhizome: sections between pseudobulbs 1.5—2.5 cm long. *Pseudobulbs* close, depressed conical, 1.5—2.5 x 1.5—3 cm. *Petiole* 1—1.5 cm. *Leaf blade* ?elliptic, 7—9.2 x c. 1.8 cm, index (length/width) c. 3.9; ?subacute. *Inflorescence* an elongated, rather lax raceme, erect to patent, 28—54 cm, 23—33-flowered. *Peduncle* 14—25 cm. *Rhachis* not thickened, 14—22 cm long, glabrous. *Floral bracts* triangular, 3—4 x c. 2 mm, acute. *Flowers* spreading to reflexed, secund, not fully opening, many simultaneously. *Pedicel* and *ovary* 5.5—9 mm long, basal node on a 0.8—2 mm-long stump. *Median sepal* porrect to recurved, ovate, 4.5—7.5 x 2—4.2 mm, index 2.3—3.8; acute, margins ciliate, base rather broadly attached; rather thin, adaxially pubescent, abaxially glabrous. *Lateral sepals* recurved, elliptic to ovate, 6—8 x 2.5—4.2 mm, index 1.9—2.4; acute to acuminate, otherwise as the median sepal. *Petals* ± porrect, spatulate, 2—2.5 x 0.8—1.5 mm, index 1.6—2.5; acute to acuminate, margins ciliate distally, base broadly attached; rather thick with a thick top, surface pubescent distally. *Lip* recurved in the proximal half, pouch-shaped distally, obovate in outline, 4.8—5.5 x 1.8—3.2 mm, index 1.6—2.8; rounded, margins ciliate; rather thin; adaxially somewhat concave and with a median slit reaching up to c.

Figure 31. *Bulbophyllum scaphiforme* J.J. Verm. (141) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, above: a single pair, below: two pairs. – a (plant). Modified after Seidenfaden & Smitinand (1961); a (inflorescence). From Tixier *s.n.* (herbarium specimen); b–g. From GT 7464 (spirit sample).

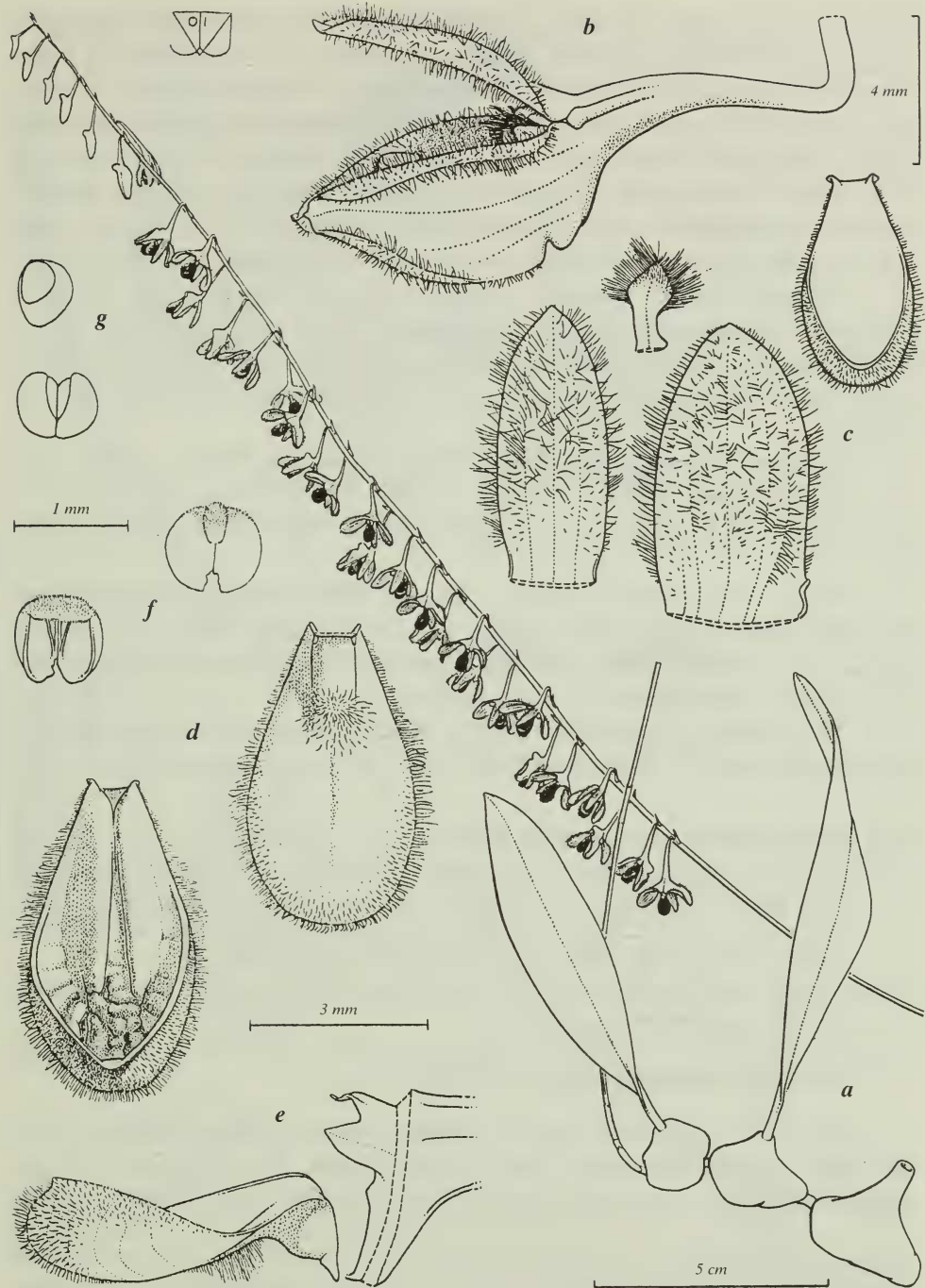


Figure 31. *Bulbophyllum scaphiforme* J.J. Verm. (141)

1/3 of the lip near the base, with 2 distinct, obtuse ridges diverging proximally, running $\pm$ parallel over c. 3/4 of the lip, and ending in some irregularly shaped calli, surface with irregular, radiating furrows distally but otherwise glabrous; abaxially with a wide, rounded ridge near the base, surface otherwise convex, pubescent, or only so in front of the basal ridge and towards the margins. *Column* 1—1.6 mm long, stigma with a distinct, obtuse tooth slightly below its base. *Stelidia* triangular, 0.4—0.7 mm long, acute. *Anther*: front margin and abaxially towards the tip densely papillose.

Colours: Sepals blackish purple, yellowish towards the base, or yellowish with blackish purple veins, margins and scattered spots. Petals blackish purple distally, yellowish proximally, often with a blackish purple vein. Lip blackish purple with green or yellowish ridges adaxially. Anther yellow.

Habitat & ecology: Alt. 1100–1400 m. Flowering in Mar—May, Jul.

Distribution: CHINA: Yunnan (*vide* S.C. Chen *et al.*, under *B. nigrescens*). THAILAND (5 specimens seen). VIETNAM: southern part (1).

Notes: This species has been confused with *Bulbophyllum nigrescens* by Seidenfaden & Smitinand (1961), and Seidenfaden (1979). It is clearly distinct from this species in having a pouch-shaped (or boat-shaped) lip. The specific epithet refers to that character.

No vegetative parts are available, the description has been completed from Seidenfaden & Smitinand (1961, fig. 319, sub *B. nigrescens*).

142. *Bulbophyllum nigripetalum* Rolfe – Fig. 32, plate 25.

Bulbophyllum nigripetalum Rolfe, Bull. Misc. Inform., Kew (1891) 197; Summerh., Kew Bull. 6 (1952) 471. — SYNTYPES: “said to have been imported (...) from the West Coast of Africa”, later shown to originate from Asia by Summerhayes (1952), *O’Brien cult.* (1891) (K, lecto.), *O’Brien cult.* (1889) (K).

Bulbophyllum secundum sensu Seidenf., Dansk Bot. Ark. 33, 3 (1979) 103 (partly, incl. syn. *B. nigripetalum*), non Hook.f.

Bulbophyllum nigrescens sensu S.C. Chen *et al.*, Native Orch. China (1999) 35 (**lower left colour photograph only**), non Rolfe.

Rhizome 1.5—3 mm diam., sections between pseudobulbs 0.6—2.5 cm long. *Pseudobulbs* close, ovoid or low-conical, 0.9—1.7 x 0.9—1.8 cm. *Petiole* 0.8—2 cm. *Leaf blade* elliptic, 5.2—17 x 0.6—1.5 cm, index (length/

Figure 32. *Bulbophyllum nigripetalum* Rolfe (142) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Lip, adaxial side; f. Column and lip, lateral view; g. Anther, left: abaxial side, right: adaxial side; h. Pollinia, above: two pairs, below: single pair. – a. From *Henry 13055* (herbarium specimen); b—d, f—h. From *Morrison 1032* (spirit sample); e. From *Maxwell 89-524* (herbarium specimen).

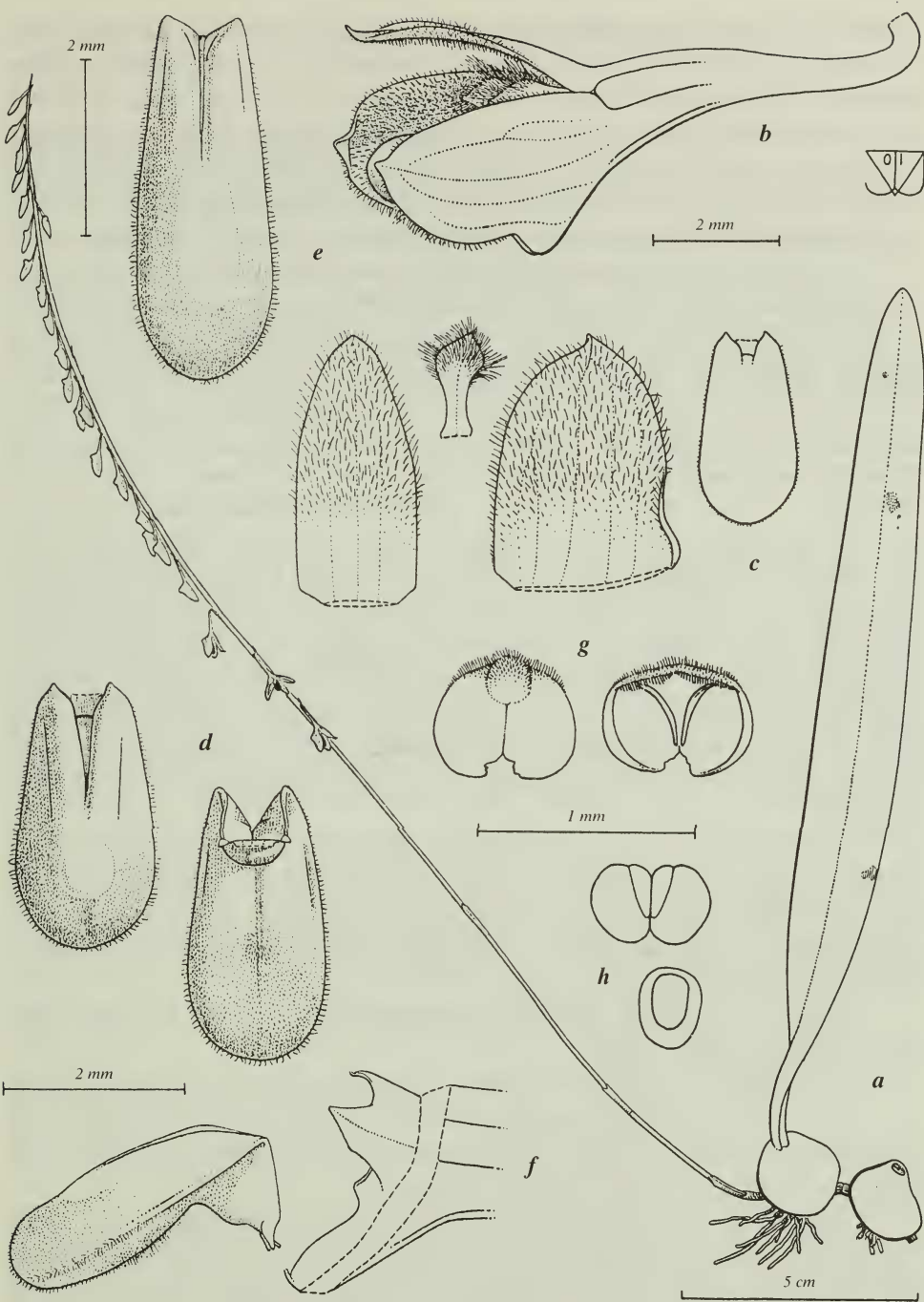


Figure 32. *Bulbophyllum nigripetalum* Rolfe (142)

width) 6—11.4; obtuse. *Inflorescence* an elongated, rather lax raceme, erect to patent, 15—49 cm, 13—32-flowered. *Peduncle* 8—25 cm, bracts c. 5, the longest 4—9 mm long. *Rhachis* not thickened, 5.5—25 cm long, glabrous. *Floral bracts* triangular, 1.8—4.5 x 1—2 mm, acuminate. *Flowers* spreading to reflexed, secund, not fully opening, many simultaneously. *Pedicel* and *ovary* 3.8—6.5 mm long, basal node on a 0.5—0.8 mm-long stump. *Median sepal* porrect to recurved, ovate to triangular, 3.1—6 x 1.3—2.2 mm, index 2—3.6; obtuse to acute, margins ciliate, base rather narrowly attached; rather thin, adaxially pubescent, abaxially glabrous. *Lateral sepals* recurved, 3—6 x 2.2—3 mm, index 1.3—2.2; otherwise as the median sepal. *Petals* $\pm$ porrect, elliptic to obovate or spatulate, 1.6—2.2 x 0.5—1 mm, index 1.8—3.6; obtuse to acuminate, margins ciliate distally, base broadly attached; rather thin with a thick tip, surface pubescent distally. *Lip* recurved in the proximal half, obovate to elliptic, 2.8—4.2 x 1—1.6 mm, index 1.8—3; rounded to obtuse, margins ciliate; thick and fleshy; adaxially somewhat concave near the base, with 3 ridges: 2 distinct, obtuse ridges diverging proximally, continuing over 1/3—3/4 of the lip, and a thin, low, sometimes inconspicuous median ridge continuing over c. 1/2 of the lip, surface glabrous, finely velutinous towards the margins; abaxially with a wide, rounded ridge near the base, surface elsewhere convex, partly or entirely velutinous. *Column* 1—1.3 mm long, stigma distinctly protruding at its base, or with a tooth slightly below its base. *Stelidia* triangular, 0.3—0.6 mm long, acute. *Anther*: front margin and abaxially towards the tip densely papillose.

Colours: Sepals cream-coloured or yellow, near the base often with blackish purple veins, sometimes blackish purple distally, or blackish purple all over. Petals blackish purple, sometimes yellowish with a purple vein proximally. Lip blackish purple, often yellowish at the base. Flowers with a lemon or turpentine scent (1 obs.)

Habitat & ecology: Epiphyte or lithophyte in forest. Alt. 1000–1300 m. Flowering in Mar—May.

Distribution: CHINA: Yunnan (1). THAILAND (3 specimens seen).

Notes: Erroneously synonymised with *Bulbophyllum secundum* by Seidenfaden (1979); it differs in having non-resupinate flowers, and adaxially pubescent sepals. It is also of larger stature.

Similar to *B. nigrescens*, it differs in having a shorter lip that is bi-convex and fleshy towards the tip. The adaxial surface is ?always (sometimes difficult to see in herbarium specimens) very finely velutinous towards the margins (glabrous in *B. nigrescens*). An additional difference may be that *B. nigripetalum* has a thin, sometimes inconspicuous median ridge instead of a median slit, as in *B. nigrescens*. The differences between the two seem

minor, but so far all material can be assigned unequivocally to one or the other species.

143. *Bulbophyllum nigrescens* Rolfe – Fig. 33, plate 26, 27.

Bulbophyllum nigrescens Rolfe, Bull. Misc. Inform., Kew (1910) 158; Seidenf. & Smitin., Orch. Thailand 3 (1961) 426 (partly, excl. fig. 319 [is *B. scaphiforme*]); Seidenf., Dansk Bot. Ark. 33, 3 (1979) 104 (partly, excl. fig. 64 [is *B. scaphiforme*]). — TYPE: Thailand, Chiangmai, Doi Suthep, *Kerr 84* (K, holo.).

Bulbophyllum angusteellipticum Seidenf., Nordic J. Bot. 1 (1981) 209. — TYPE: Thailand, Doi Inthanond, *Seidenfaden & Smitinand (GT) 8310* (C, holo., not seen).

[Not *Bulbophyllum nigrescens* Schltr, Repert. Spec. Nov. Regni Veg. Beih. 1 (1913) 839 (= *Bulbophyllum rubromaculatum* W. Kittr., Bot. Mus. Leaf., Harvard University 30 [1981] 100).]

[Not *Bulbophyllum nigrescens sensu* Tran Hop, Orch. Vietnam (1998) 113, col. phot. 30 (= *B. scaphiforme*); S.C. Chen *et al.*, Native Orch. China (1999) 35 (= *B. nigripetalum* and *B. scaphiforme*).]

Rhizome 2—3.5 mm diam., sections between pseudobulbs 0.6—2.5 cm long. *Pseudobulbs* close, ovoid or low-conical, 0.8—1.7 x 1—2 cm. *Petiole* 0.8—2 cm. *Leaf blade* elliptic to ovate, 6—13 x 0.9—1.7 cm, index (length/width) 4—8.4; obtuse. *Inflorescence* an elongated, rather lax raceme, erect to patent, 23—44 cm, 13—27-flowered. *Peduncle* 8—22 cm, bracts c. 5, the longest 6.5—9 mm long. *Rhachis* not thickened, 9—20 cm long, glabrous. *Floral bracts* triangular, 1.8—4.5 x 1—2 mm, acuminate. *Flowers* spreading to reflexed, secund, not fully opening, many simultaneously. *Pedicel* and *ovary* 5—11 mm long, basal node on a 0.5—0.8 mm-long stump. *Median sepal* porrect to recurved, ovate to triangular, 5.5—9.5 x 1.8—3.2 mm, index 1.8—5; obtuse to acute, margins ciliate, base rather narrowly attached; rather thin, adaxially pubescent, abaxially glabrous. *Lateral sepals* recurved, 6.5—10.5 x 2.7—4.2 mm, index 1.6—3.4; otherwise as the median sepal. *Petals* ± porrect, elliptic to obovate or spatulate, 1.5—2.5 x 0.8—1.5 mm, index 1.3—3.2; obtuse to acuminate, margins ciliate distally, base broadly attached; rather thin with a thick top, surface pubescent distally. *Lip* recurved in the proximal half, obovate to elliptic, 5—7 x 2—3.3 mm, index 1.8—3.5; rounded to obtuse, margins ciliate; rather thin; adaxially somewhat concave near the base and with a median slit or furrow reaching up to 1/3—2/3 of the lip, with 2 distinct, obtuse ridges diverging proximally, continuing over 1/3—3/4 of the lip, and often ending in a patch of irregularly shaped verrucae, surface glabrous; abaxially with a wide, rounded ridge near the base, surface elsewhere concave to flat, glabrous or partly pubescent. *Column* 1.4—1.8 mm long, stigma distinctly protruding at its base, or with a distinct, obtuse to acute tooth slightly below its base. *Stelidia* triangular, 0.5—0.8 mm long, acute. *Anther*: front margin and abaxially

towards the tip densely papillose.

Colours: Sepals yellowish, stained with blackish purple and with blackish purple veins; sometimes entirely blackish purple adaxially and pale reddish brown abaxially. Petals and lip almost entirely blackish purple; the petals proximally sometimes yellow with a blackish purple vein.

Habitat & ecology: Epiphyte or lithophyte in deciduous or evergreen forest. Alt. 700–1500 m. Flowering in Jan–May, Jul.

Distribution: THAILAND (8 specimens seen). VIETNAM (1).

Notes: This has been confused with *Bulbophyllum scaphiforme* by Seidenfaden & Smitinand (1961), and Seidenfaden (1979), and with *B. scaphiforme* and *B. nigripetalum* by S.C. Chen *et al.* (1999). The differences are given below the species mentioned.

The identity of *B. angusteellipticum* has been surmised from an almost identical sample from the type locality.

144. *Bulbophyllum trulliferum* J.J. Verm. & A. Lamb – Fig. 34, plate 28.

Bulbophyllum trulliferum J.J. Verm. & A. Lamb, Blumea 38 (1994) 337. – TYPE: Malaysia, Sabah, Crocker Range, Tenom Orchid Centre (T.O.C.) cult. 2321 (L. hol.).

Rhizome 1.8–2.5 mm diam., sections between pseudobulbs 0.6–1 cm long. *Pseudobulbs* $\pm$ touching, depressed conical to almost discoid, 0.4–0.7 x 1.2–2 cm. *Petiole* c. 1 cm. *Leaf blade* elliptic, 8.5–17 x 0.8–1.2 cm, index (length/width) 10–14.2; acute. *Inflorescence* an elongated, rather dense raceme, 29–32 cm, 10–14-flowered. *Peduncle* erect to patent, 27–29 cm, bracts c. 5, the longest c. 5 mm long. *Rhachis* nodding, not thickened, 2–3 cm, glabrous. *Floral bracts* ovate, c. 1 x 0.8 mm, acute. *Flowers* not fully opening, many simultaneously. *Pedicel* and *ovary* 2.5–3 mm long, finely hirsute, basal node $\pm$ flush with the surface of the rhachis. *Median sepal* porrect, ovate, 3–3.3 x 2–2.6 mm, index 1.2–1.5; rounded to obtuse, margins ciliate, base rather broadly attached; rather thin, surface adaxially glabrous, abaxially finely hirsute. *Lateral sepals* recurved, 3–3.8 x 2–3 mm, index 1.3–1.5; obtuse, margins papillose; otherwise as the median sepal. *Petals* porrect, triangular, c. 1.5–2.5 x 0.5–0.7 mm, index 3–4.3; subacute, margins ciliate, base broadly attached; thin; surface glabrous.

Figure 33. *Bulbophyllum nigrescens* Rolfe (143) – a. Habit; b. Flower; c. Flower analysis. from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e, f, g. Lip, adaxial side; h, i. Column and lip, lateral view; j. Anther, left: abaxial side, right: adaxial side; k. Pollinia, above: single pair, below: two pairs. – a–d, h, j, k. From *Jongejan cult. 2591* (spirit sample); e. From *Cumberlege 1021* (herbarium specimen); f, i. From *Hort. Aarhus 78-B-632* (spirit sample); g. From *Maxwell 89-523* (herbarium specimen).

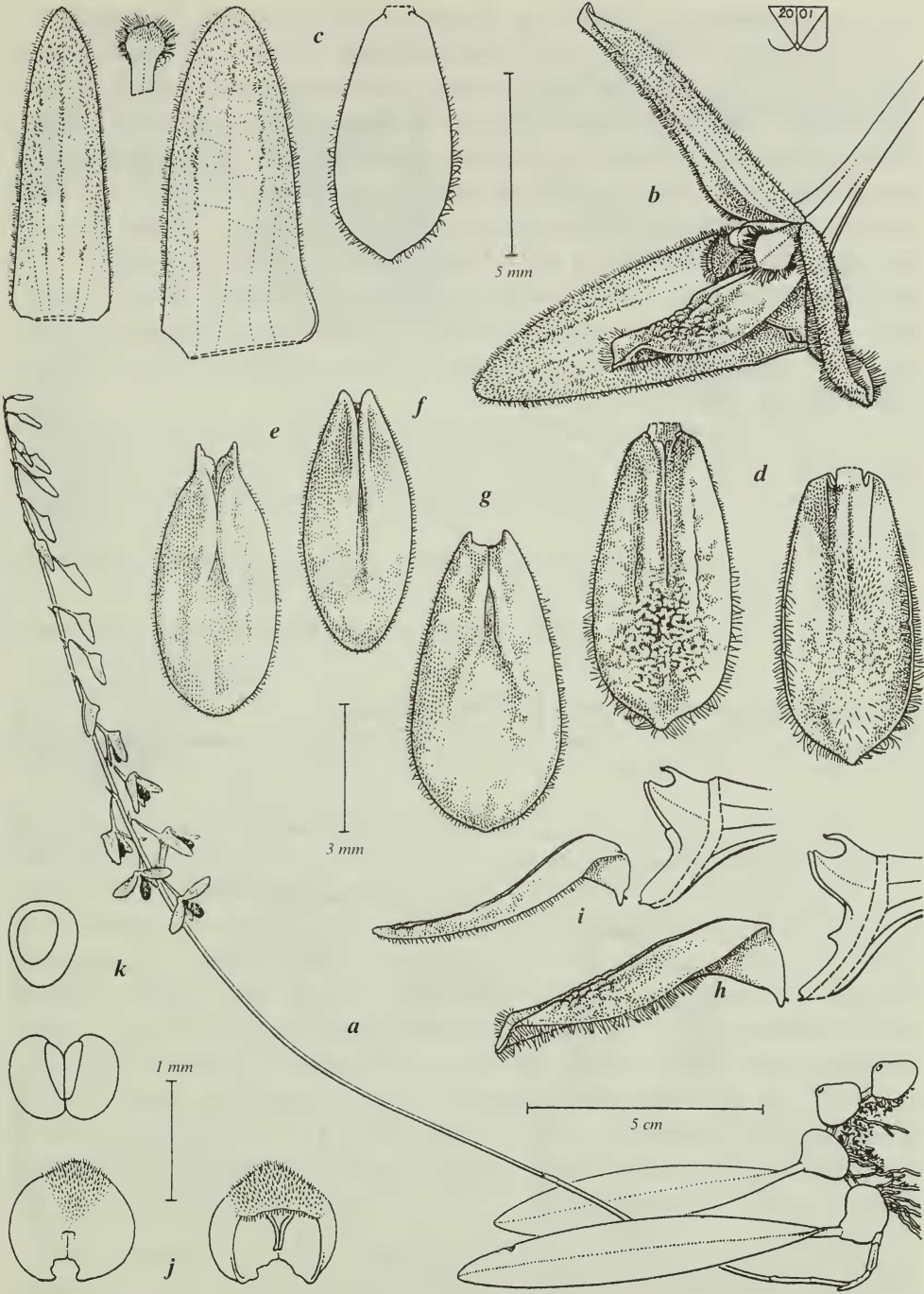


Figure 33. *Bulbophyllum nigrescens* Rolfe (143)

Lip abruptly recurved c. half-way, oblong to subspathulate, 2—2.5 x 1.1—1.4 mm, index 1.5—2.1; rounded, margins ciliate except near the base and near the tip; very thick; adaxially concave and with a bifid callus near the base, with 2 distinct, rounded ridges diverging proximally and distally, distally enclosing a circular depression, adaxial surface glabrous; abaxially with a wide, retuse ridge proximally, convex and with thick, stiff, long hairs towards the margins distally, surface otherwise glabrous. *Column* 1.6—1.7 mm long, stigma protruding at its base. *Stelidia* narrowly triangular, c. 1 mm long, acute, with a small, deltoid, obtuse tooth along the upper margin, and a larger, antrorse, triangular obtuse tooth along the lower margin, near the base. *Anther*: front margin ciliate, abaxial surface with an inconspicuous ridge only, $\pm$ glabrous.

Colours: Flowers cream-coloured; sepals with a reticulate pattern of pale purple veins; petals with the vein, margin and cilia pale purple; lip orange towards the base, adaxially with a large, blackish spot near the tip; hairs white.

Habitat & ecology: Epiphyte in primary forest. Alt. c. 900 m. Flowering observed in Sep.

Distribution: MALAYSIA: Sabah, Crocker Range (3 specimen seen).

145. *Bulbophyllum jolandae* J.J. Verm. – Fig. 35.

Bulbophyllum jolandae J.J. Verm., Orch. Borneo 2 (1991) 241, **colour photograph pl.**

16f. — TYPE: Malaysia, Sabah, Ulu Padas, Vermeulen 602 (L, holo.).

Rhizome c. 3 mm diam., sections between pseudobulbs 0.6—0.8 cm long. *Pseudobulbs* touching, ovate, 1.2—1.5 x 1—1.2 cm. *Petiole* 2—2.5 cm. *Leaf blade* elliptic, 8.5—9.5 x 2—2.3 cm, index (length/width) 4—4.3; acute. *Inflorescence* an elongated, very lax raceme, 25—42 cm, 4—14-flowered. *Peduncle* erect to patent, 20—22 cm, bracts c. 4, the longest c. 6 mm long. *Rhachis* not thickened, erect or arching, 5—21 cm long, glabrous. *Floral bracts* triangular, 2.5—3 x 1 mm, acuminate. *Flowers* opening wide, several simultaneously, anthesis from the base of the rhachis upwards. *Pedicel* and *ovary* 48—50 mm long, basal node on a c. 1.5 mm-long stump. *Median sepal* reflexed, triangular, c. 18.5 x 2 mm, index 9.2—9.3; caudate, margins ciliolate near base, base rather broadly attached; thin, surface glabrous. *Lateral sepals* ovate-triangular, c. 20 x 4.5 mm, index 4.4—4.5; acute-

Figure 34. *Bulbophyllum trulliferum* J.J. Verm. (144) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, above: two pairs, below: single pair. – a. Modified after a sketch and a photograph of A. Lamb; b—g. All from *Tenom Orchid Centre cult.* 2321 (spirit sample).

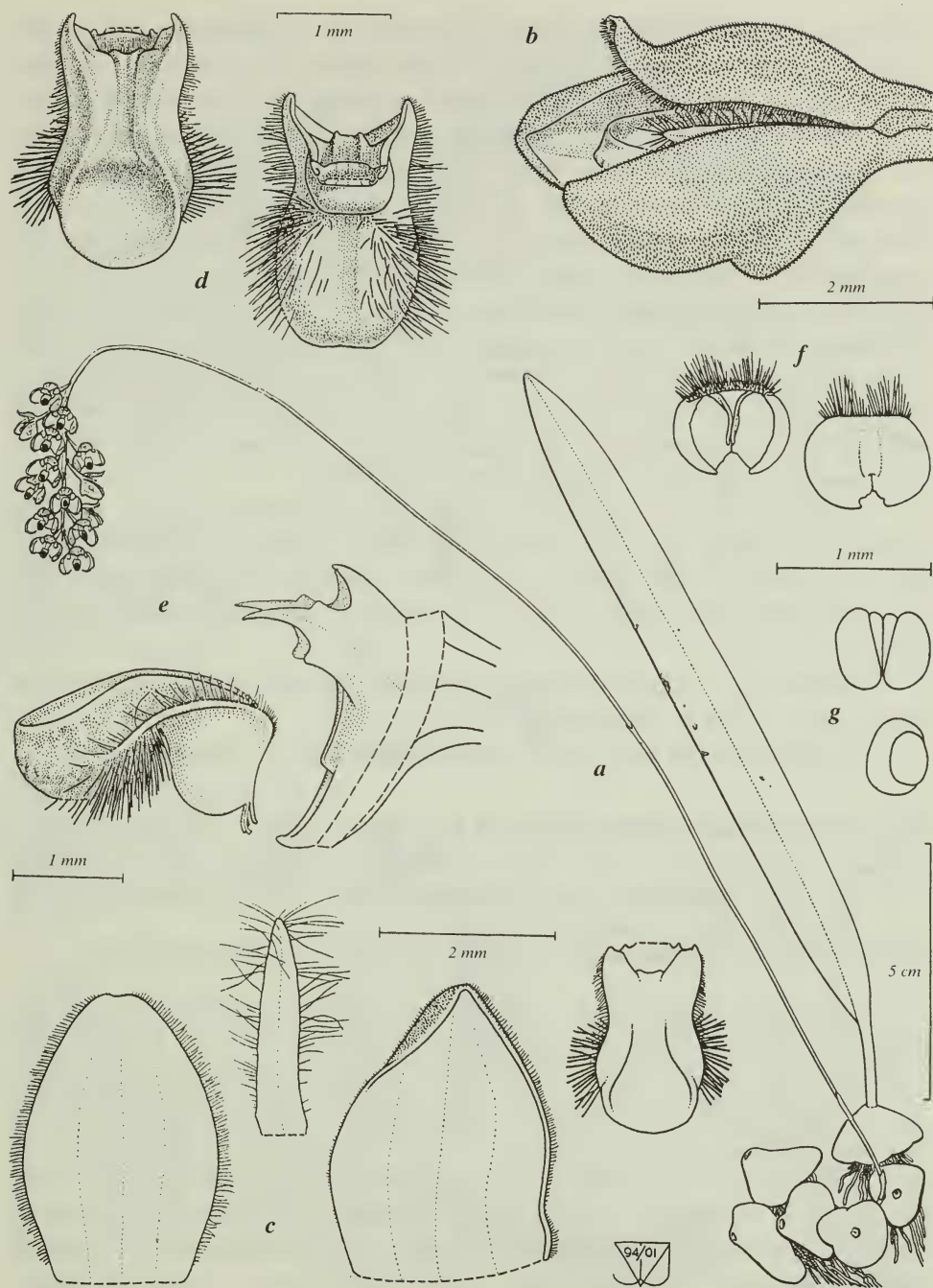


Figure 34. *Bulbophyllum trulliferum* J.J. Verm. (144)

acuminate, upper margin glabrous; otherwise as the median sepal. *Petals* porrect, falcate, triangular, c. 4.2 x 1.2 mm, index 3.5; acuminate, margins ciliate except near the tip, base broadly attached; thin, surface glabrous. *Lip* curved in the basal half, $\pm$ elliptic to ovate, c. 7.5 x 2.8 mm, index 2.6—2.7; rounded, margins ciliate, and with long, thin, $\pm$ straight hairs except near the base and near the tip; lip rather thin with a thick base, surface glabrous; adaxially concave near the base, with a median slit proximally opening into a small cavity and distally continuing over c. 1/3 of the lip, with two rounded ridges continuing over c. 1/3 of the lip, proximally diverging and almost fused to a single median ridge distally; abaxially with a retuse ridge near the base. *Column* c. 2 mm long, stigma protruding at its base. *Stelidia* c. 0.7 mm long, tip acute; $\pm$ rectangular in outline with an antrorse, deltoid, subacute tooth along the upper and lower margin. *Anther*: front margin long ciliate, abaxial surface papillose.

Colours: Sepals proximally somewhat glaucous green, distally yellowish, medium green in between. Petals greenish, purplish near the base, margins and cilia purple. Lip purplish except for a paler patch near the base, short hairs white, long hairs purple. Column greenish, blotched purple.

Habitat & ecology: Epiphyte in moss, in open montane *kerangas* forest. Alt. c. 1500 m. Flowering observed in Oct.

Distribution: MALAYSIA: Sabah, Ulu Padas (1 specimen seen).

146. *Bulbophyllum comberipictum* J.J. Verm., *sp. nov.* – Fig. 36.

Bulbophyllum comberipictum J.J. Verm., a *Bulbophyllo jolandae* pedicello cum ovario 8—20 mm longo, labello pilis tenuibus lanatis differt. – TYPE: Malaysia, Sarawak, Hose Mts., Hort. Leiden 914194 (L, holo.).

Bulbophyllum sp. Comber, Orchids of Sumatra (2001) 816, **colour photograph**.

Rhizome c. 3 mm diam., sections between pseudobulbs 0.6—1.2 cm long. *Pseudobulbs* close or touching, ovate-conical, c. 1.5 x 1.5 cm. *Petiole* c. 2.5 cm. *Leaf blade* elliptic, c. 10.5 x 3.1 cm, index (length/width) c. 3.3; acute. *Inflorescence* an elongated, rather dense raceme, c. 32 cm, 26—31-flowered. *Peduncle* erect to patent, c. 18.5 cm, bracts c. 4, the longest c. 7 mm long. *Rhachis* not thickened, c. nodding, c. 13.5 cm long, glabrous. *Floral bracts* triangular, c. 2.5 x 1 mm, acuminate. *Flowers* opening wide, several simultaneously, anthesis from the base of the rhachis upwards. *Pedicel* and *ovary* 8—20 mm long, basal node on a c. 1 mm-long stump.

Figure 35. *Bulbophyllum jolandae* J.J. Verm. (145) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side. – All from Vermeulen 602 (living plant).

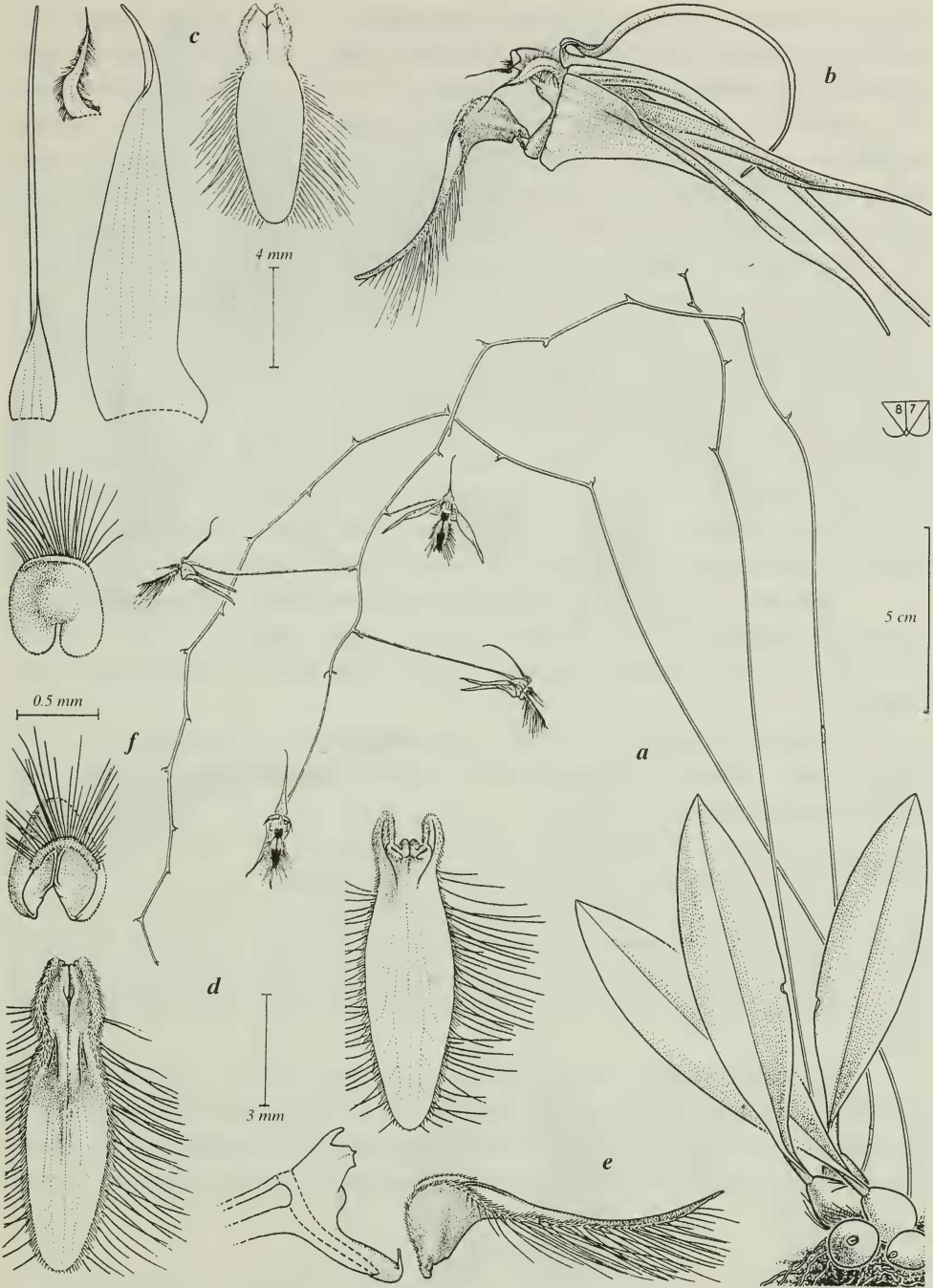


Figure 35. *Bulbophyllum jolandae* J.J. Verm. (145)

Median sepal c. porrect to reflexed, triangular, c. 7 x 1.4 mm, index c. 5; tapering towards the tip and acute, base rather broadly attached; thin, glabrous. *Lateral sepals* ovate-triangular, c. 7 x 2.2–2.4 mm, index 2.9–3.2; subacute; otherwise as the median sepal. *Petals* porrect, falcate, triangular, 2.7–2.8 x 0.6–0.9 mm, index 3.1–4.5; acuminate, margins ciliate except near the base and near the tip, base broadly attached; thin, surface glabrous. *Lip* curved in the basal half, $\pm$ elliptic, c. 4.5 x 1.2–1.3 mm, index 3.4–3.8; truncate, margins ciliate near the base and at the tip, in between with long, thin, distinctly wavy hairs; lip rather thin with a thick base, surface glabrous; adaxially concave near the base, with a median slit proximally opening into a small cavity and distally continuing over c. 4/5 of the lip, with two rounded ridges continuing over c. 4/5 of the lip, diverging proximally and almost fused to a single median ridge distally; abaxially with a retuse ridge near the base. *Column* c. 1.3 mm long, stigma protruding at its base. *Stelidia* c. 0.4 mm long, tip acute; $\pm$ rectangular in outline with an antrorse, deltoid, subacute tooth along the upper and lower margin. *Anther*: front margin long ciliate, abaxial surface $\pm$ glabrous.

Colours: Sepals creamy yellow, the median flushed with some purple along the margins. Petals blackish purple, with purple cilia. Lip whitish, marked with dark purple towards the tip and along the margins; hairs purple.

Habitat & ecology: Recorded from submontane *kerangas* forest, and from a steep, densely forested ravine cut into volcanic soil. Alt. 800–1300 m. Flowering observed in Nov.

Distribution: MALAYSIA: Sarawak, Hose Mts. (1 specimen seen). INDONESIA: Sumatra (photo Comber, see below).

Notes: Similar to *Bulbophyllum jolandae* but distinct because of its much denser inflorescence with much smaller flowers on shorter pedicels. The lip has a more distinct and distinctly longer median ridge (reaching up to 4/5 of the length of the lip), and distinctly woolly rather than straight hairs.

For a while this species was known only from a photograph by Comber in Sumatra; the specific name refers to this. It was not found again in spite of an extensive search of the same locality. The photograph shows a plant almost identical to the Sarawak specimen, but with narrower leaves.

Figure 36. *Bulbophyllum comberipictum* J.J. Verm. (146) – a. Habit; b. Flower: c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, left: abaxial side, right: adaxial side; g. Pollinia, above: two pairs, below: single pair. – All from Hort. Leiden 914194 (spirit sample).

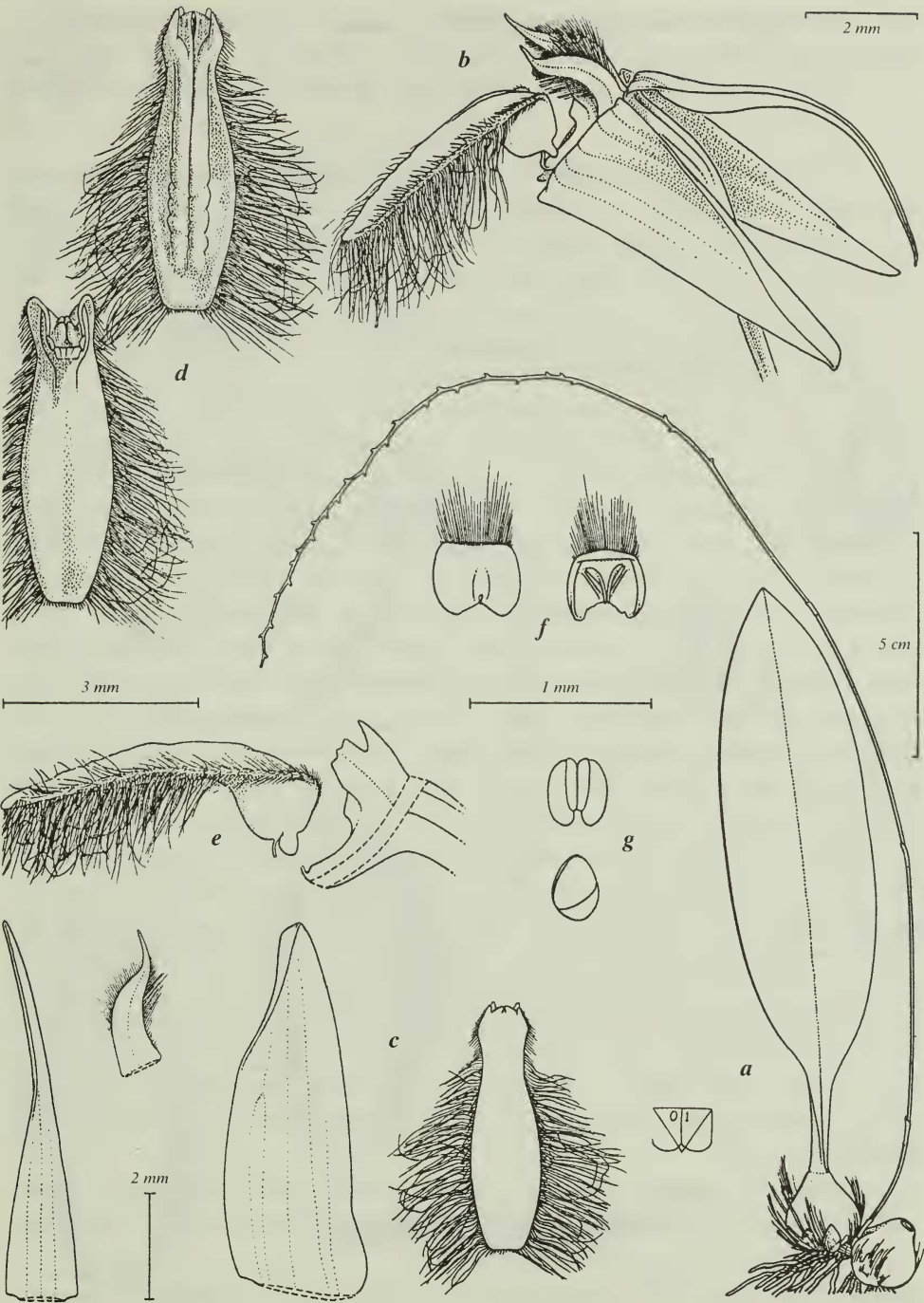


Figure 36. *Bulbophyllum comberipictum* J.J. Verm. (146)

147. *Bulbophyllum lasioglossum* Rolfe ex Ames – Fig. 37, plate 29.

Bulbophyllum lasioglossum Rolfe ex Ames, Orch. 1 (1905) 100. — TYPE: Philippines, Luzon, Bataan, Mt. Mariveles, Lamao River, Borden 797 (PNH, holo., destroyed; AMES, K, iso.).

Rhizome 1.8—3 mm diam., sections between pseudobulbs 0.6—0.8 cm long. *Pseudobulbs* ± touching, ovoid, 0.7—1.5 x 0.5—0.8 cm. *Petiole* 1.4—2.6 cm. *Leaf blade* elliptic to ovate, 5.8—12 x 1.5—3.2 cm, index (length/width) 2.6—4.7; (sub-)acute. *Inflorescence* an elongated, rather lax raceme, 16—33 cm, 21—44-flowered. *Peduncle* erect to patent, 11.5—19 cm, bracts c. 5, the longest 6—8 mm long. *Rhachis* nodding, not thickened, 5—14.5 cm, glabrous. *Floral bracts* triangular, 1.5—3 x 0.8—1.2 mm, acute. *Flowers* opening wide, several simultaneously, anthesis from the top of the rhachis downwards. *Pedicel* and *ovary* 7.5—14 mm long, basal node on a 0.4—1 mm-long stump. *Median sepal* porrect to recurved, elliptic, 6.5—9 x 2—2.2 mm, index 3.2—4.1; acute to acuminate, margins ciliate, base rather narrowly attached; thin, surface glabrous. *Lateral sepals* recurved or spreading, ovate-triangular, 6.5—9 x 2.5—2.6 mm, index 2.6—3.6; margins glabrous, base broadly attached; otherwise as the median sepal. *Petals* porrect, ovate, 2.5—3.2 x 0.6—1 mm, index 3—4.6; acute, margins ciliate, base broadly attached; thin, surface glabrous. *Lip* curved near the base, obscurely 3-lobed; *midlobe* ovate, 5—7 x 1.2—2.2 mm, index 2.7—4.2; rounded to obtuse, margins distally ciliate, otherwise with long, thin, straight or slightly wavy hairs; rather thin with a thick base, surface glabrous; adaxially concave near the base and with a median slit reaching up to 1/3 of the lip, with two obtuse ridges diverging proximally towards the distal end of the lateral lobes, distally fused to a single median ridge and continuing over c. 1/3 of the lip, surface otherwise slightly concave; abaxially with a wide, retuse ridge near the base; *lateral lobes* attached along the proximal 1/6 of the lip, erect, semi-circular, margins ciliate, broadly attached, rather thick, adaxially pubescent towards the margins, abaxially glabrous. *Column* 1.2—1.5 mm long, stigma with a distinct, deeply bifid callus at the base. *Stelidia* semi-elliptic, c. 0.5 mm long, tip acute, margins distally slightly erose. *Anther*: front margin deeply bifid, papillose, abaxial surface distally papillose.

Colours: Rhachis brownish purple. Pedicel and ovary green. Sepals and petals pale (yellowish) green. Lip dark purplish brown, or ?yellowish.

Figure 37. *Bulbophyllum lasioglossum* Rolfe ex Ames (147) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: abaxial side, right: adaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, above: two pairs, below: single pair. – a, c—g. From Borden 797; b. From *Topping s.n.* (all herbarium specimens).

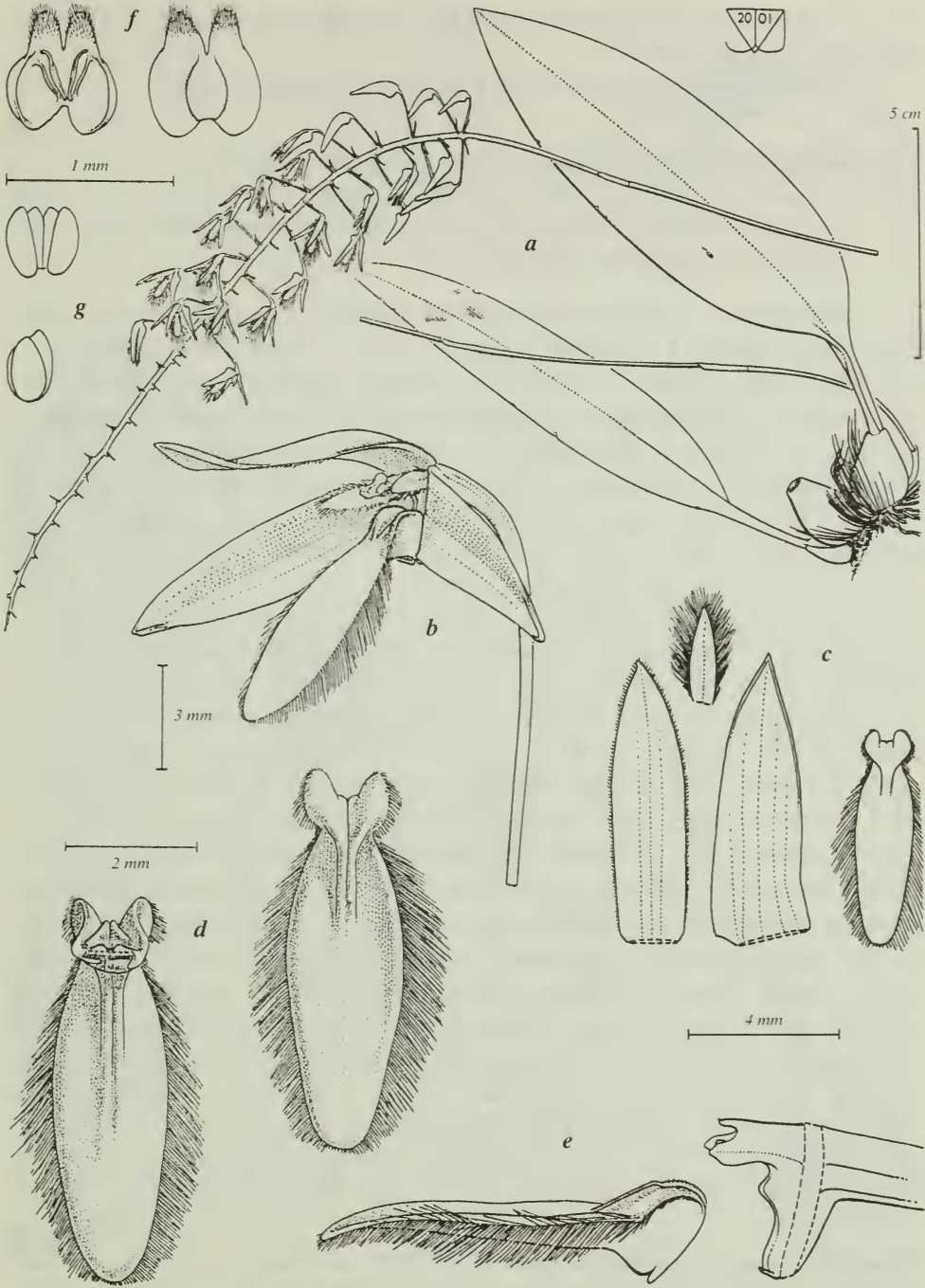


Figure 37. *Bulbophyllum lasioglossum* Rolfe ex Ames (147)

Habitat & ecology: Epiphyte in montane forest. Alt. c. 1000 m. Flowering in May—Jun.

Distribution: PHILIPPINES: Luzon (3 specimens seen).

148. *Bulbophyllum negrosianum* Ames – Fig. 38, plate 30.

Bulbophyllum negrosianum Ames, Leaf. Philipp. Bot. 5 (1912) 1586. — TYPE: Philippines, Negros, Negros Oriental, Cuernos Mts., Dumaguete, *Elmer 9821* (PNH, holo., destroyed; AMES, NY, iso.).

Rhizome 3—4 mm diam., sections between pseudobulbs 0.8—2 cm long. *Pseudobulbs* ± touching, ovoid, 1.5—2.5 x 1—1.6 cm. *Petiole* 2—5 cm. *Leaf blade* elliptic, 8.5—16 x 3.2—4.6 cm, index (length/width) 2.2—4.7; subacute. *Inflorescence* an elongated, rather dense raceme, ± patent, c. 42 cm, c. 45-flowered. *Peduncle* c. 23.5 cm, bracts c. 5, the longest c. 9 mm long. *Rhachis* not thickened, c. 18.5 cm, glabrous. *Floral bracts* triangular, 1.5—2 x 0.8—1 mm, acute. *Flowers* secund, several open simultaneously, not fully open, anthesis from the top of the rhachis downwards. *Pedicel* and *ovary* 5.5—6.5 mm long, basal node on a 0.3—0.5 mm-long stump. *Median sepal* recurved, elliptic, 5.5—5.8 x 2.2—3 mm, index 1.8—2.7; acute-acuminate, margins ciliate, base rather narrowly attached; thin, surface glabrous. *Lateral sepals* recurved, ovate, 5.5—5.8 x 3—3.5 mm, index 1.5—2; margins glabrous, base broadly attached; otherwise as the median sepal. *Petals* porrect, elliptic to ovate, 3—3.5 x 0.7—1 mm, index 3.5—4.3; subacute, margins ciliate, base broadly attached; thin, surface glabrous. *Lip* curved near the base, obscurely 3-lobed; *midlobe* elliptic to obovate, c. 4 x 1.5—2.3 mm, index 1.7—2.7; obtuse, margins with long, thin, straight or slightly wavy hairs; rather thin with a thick base, surface glabrous; adaxially concave near the base and with a median slit reaching up to 1/4 of the lip, with two obtuse ridges diverging proximally towards the distal end of the lateral lobes, distally fused to a distinct, thick callus with two knobs at about 1/3 the way up of the lip, a third, obtuse median ridge issuing distally from this callus, bordered by distinct furrows and continuing over c. 3/4 of the lip, surface otherwise concave; abaxially with a wide, retuse ridge near the base; *lateral lobes* attached along the proximal 1/5 of the lip, erect, semi-circular, margins with hairs, broadly attached, rather thick, adaxially pubescent towards the margins, abaxially glabrous. *Column* 1.3—1.6 mm

Figure 38. *Bulbophyllum negrosianum* Ames (148) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Lip, adaxial side; f. Column and lip, lateral view; g. Anther, above: adaxial side, below: abaxial side; h. Pollinia, above: two pairs, below: single pair. – a—d, f—h. From *Elmer 9821* (herbarium specimen); e. From *Hort. Vienna 176-90* (spirit sample).

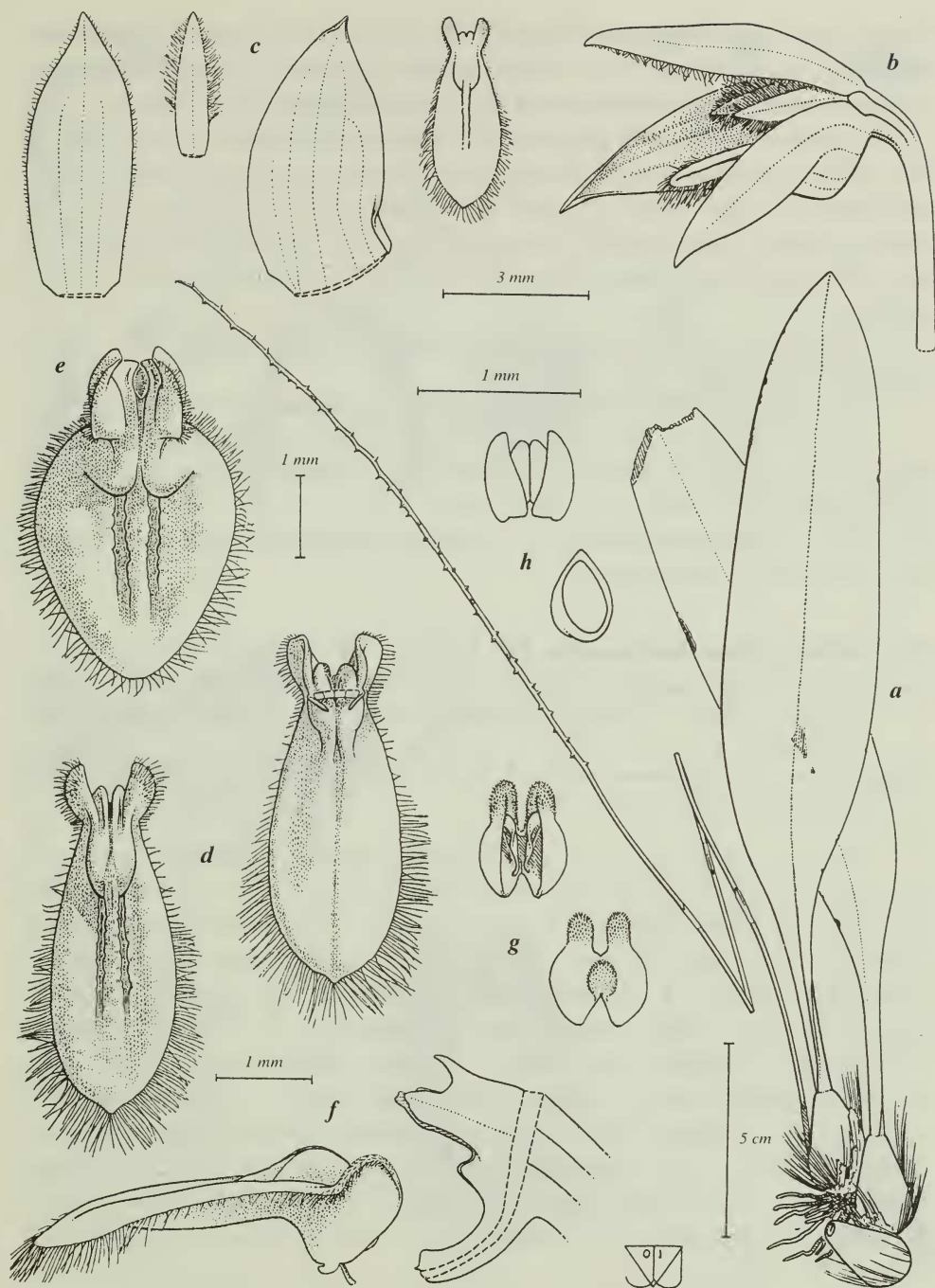


Figure 38. *Bulbophyllum negrosianum* Ames (148)

long, stigma with a distinct, deeply bifid callus at the base. *Stelidia* semi-elliptic, c. 0.5 mm long, tip obtuse, margins distally erose. *Anther*: front margin deeply bifid, papillose, abaxial surface distally papillose.

Colours: Sepals dull purple, the median whitish between the veins in the centre; or sepals orange yellow with dark red veins proximally, orange red distally. Petals dark red, with a yellowish midvein; cilia yellow. Lip yellow, adaxial side reddish brown in the centre, abaxial side with a dark red patch about half-way, pale yellow proximally. Hairs along lip margins yellow.

Habitat & ecology: Epiphyte in mossy montane forest. Alt. 1200—1400 m. Flowering in Apr, May.

Distribution: PHILIPPINES: Luzon (1 specimen seen); Negros (1).

Notes: Flowers rather similar to those of the preceding species. They differ in being smaller, and in the presence of a distinct callus adaxially on the lip, where the two lateral keels meet.

The Luzon specimen has wider floral parts than the type from Negros, but is otherwise not different.

149. *Bulbophyllum dracunculus* J.J. Verm. – Fig. 39, plate 31.

Bulbophyllum dracunculus J.J. Verm., Gard. Bull. Singapore 52 (2000) 276. — TYPE: Malaysia, Sabah, NE flank of Gunung Alab, *Hort. Leiden* 30978 (L, holo., SING, iso.).

Bulbophyllum polygaliflorum sensu J.J. Wood, Orch. Borneo 3 (1997) 247 (colour photograph only), non J.J. Wood.

Rhizome 2.5—2.7 mm diam., sections between pseudobulbs 0.4—1 cm long. *Pseudobulbs* touching, ovoid, 0.7—1.6 x 0.4—1.4 cm. *Petiole* 0.4—1.3 cm. *Leaf blade* elliptic to ovate, 5.1—8.1 x 1.2—3 cm, index (length/width) 2.7—5; obtuse to acute. *Inflorescence* an elongated, lax raceme, $\pm$ patent, 15—24 cm, 11—20-flowered. *Peduncle* 10—18 cm, bracts c. 4, the longest 4—6 mm long. *Rhachis* not thickened, 5—7 cm long, glabrous. *Floral bracts* triangular, 1.5—2.8 x 2—2.2 mm, slightly acuminate. *Flowers* not fully opening, one at a time. *Pedicel* and *ovary* 4—4.5 mm long, basal node $\pm$ flush with the surface of the rhachis. *Median sepal* $\pm$ porrect, triangular, 4—5 x 1.3—2 mm, index 2.5—3.1; acute to acuminate, margins ciliate, base rather broadly attached; rather thick, surface glabrous. *Lateral sepals* recurved, ovate, 4.5—6.3 x 2.8—4.2 mm, index 1.2—1.6; rounded to

Figure 39. *Bulbophyllum dracunculus* J.J. Verm. (149) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: abaxial side, right: adaxial side; g. Pollinia, above: two pairs, below: single pair. – All from *Hort. Leiden* 30978 (spirit sample).

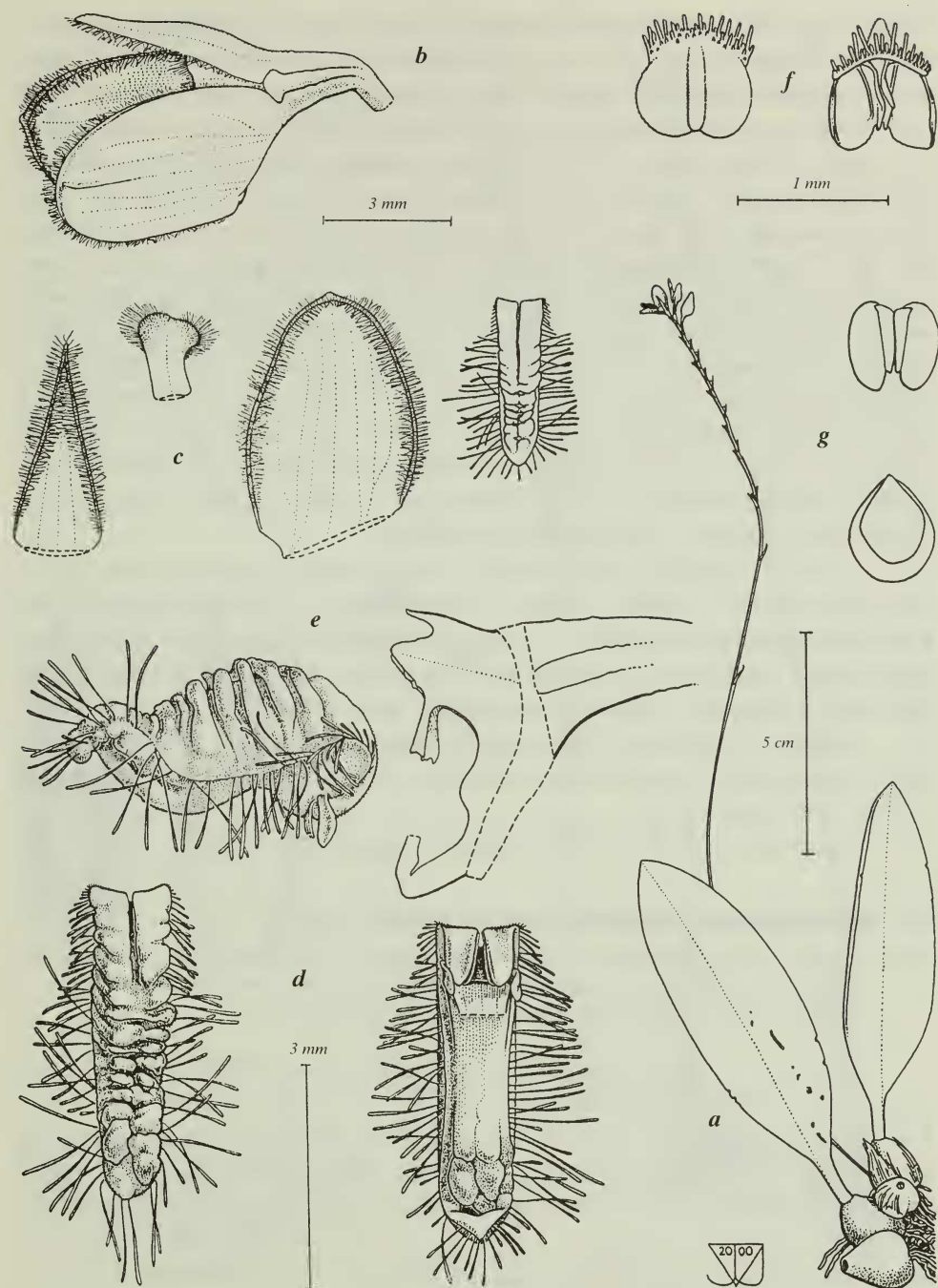


Figure 39. *Bulbophyllum dracunculus* J.J. Verm. (149)

obtuse, otherwise as the median sepal. *Petals* porrect, spatulate, 1.6—2.3 x 1.1—1.5 mm, index 1.1—1.9; truncate to retuse, margins ciliate, base rather broadly attached; rather thick, adaxial surface glabrous but with two hirsute patches near the top. *Lip* recurved near the base, oblong, 3.5—4.2 x 0.8—1.2 mm, index 3.5—4.3; obtuse, margins with slightly club-shaped hairs increasing in length and thickness towards the tip of the lip; very thick; adaxially $\pm$ flat near the base and with a median slit up to 1/3 of the lip, with 2 rows of irregularly shaped, fleshy calli, those on opposite rows partly fused c. half-way up the lip, adaxial surface finely papillose; abaxially with a truncate ridge distally divided in two rows of fleshy calli, surface glabrous. *Column* 1.2—1.8 mm long, column foot with two longitudinal, rounded lamellae. *Stelidia* triangular, 0.5—0.7 mm long, obtuse, with a distinct, downwards projecting, strap-shaped to somewhat spatulate tooth with a 2—3-furcate tip along the lower margin and sometimes with a second, minute, deltoid, obtuse to acute tooth just in front of this. *Anther*: front margin long-papillose, abaxial ridge papillose.

Colours: Peduncle dark purple, rhachis paler. Bracts pale green, suffused pale lilac. Sepals yellowish or pale green, suffused brownish red adaxially, margins with white or pink cilia. Petals translucent white, spotted with purple adaxially, margins with dark purple hairs. Lip creamy white, yellowish or pinkish, calli blackish purple, hairs purple.

Habitat & ecology: High montane forest, secondary forest, shrubby vegetation on soils derived from ultrabasic rock. Alt. 800–1800 m. Flowering in Jan, Apr, Jun—Aug.

Distribution: MALAYSIA: Sabah (4 specimens seen).

150. *Bulbophyllum polygaliflorum* J.J. Wood – Fig. 40.

Bulbophyllum polygaliflorum J.J. Wood, Kew Bull. 39 (1984) 96; J.J. Wood, Orch. Borneo 3 (1997) 247 (excl. colour photo, is *B. dracunculus* J.J. Verm.). — TYPE: Malaysia, Sarawak, *Hansen 499* (C, holo.; K, iso.).

Rhizome c. 6 mm diam., sections between pseudobulbs 1.5—4.5 cm long. *Pseudobulbs* distant, ovoid, 2—4.2 x 0.8—1.6 cm. *Petiole* 1.8—4 cm. *Leaf blade* elliptic to ovate, 9—18 x 3.2—4.7 cm, index (length/width) 2.5—4.2; acute. *Inflorescence* an elongated, rather dense raceme, erect to patent, 78—86 cm, 30—45-flowered. *Peduncle* 63—70 cm, bracts 5—9, the

Figure 40. *Bulbophyllum polygaliflorum* J.J. Wood (150) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, left: single pair, right: two pairs. – a (plant), b–g. From *SFN 27956* (herbarium specimen), = *Carr 3595* (spirit sample); a (inflorescence). From *Hansen 499* (herbarium specimen).

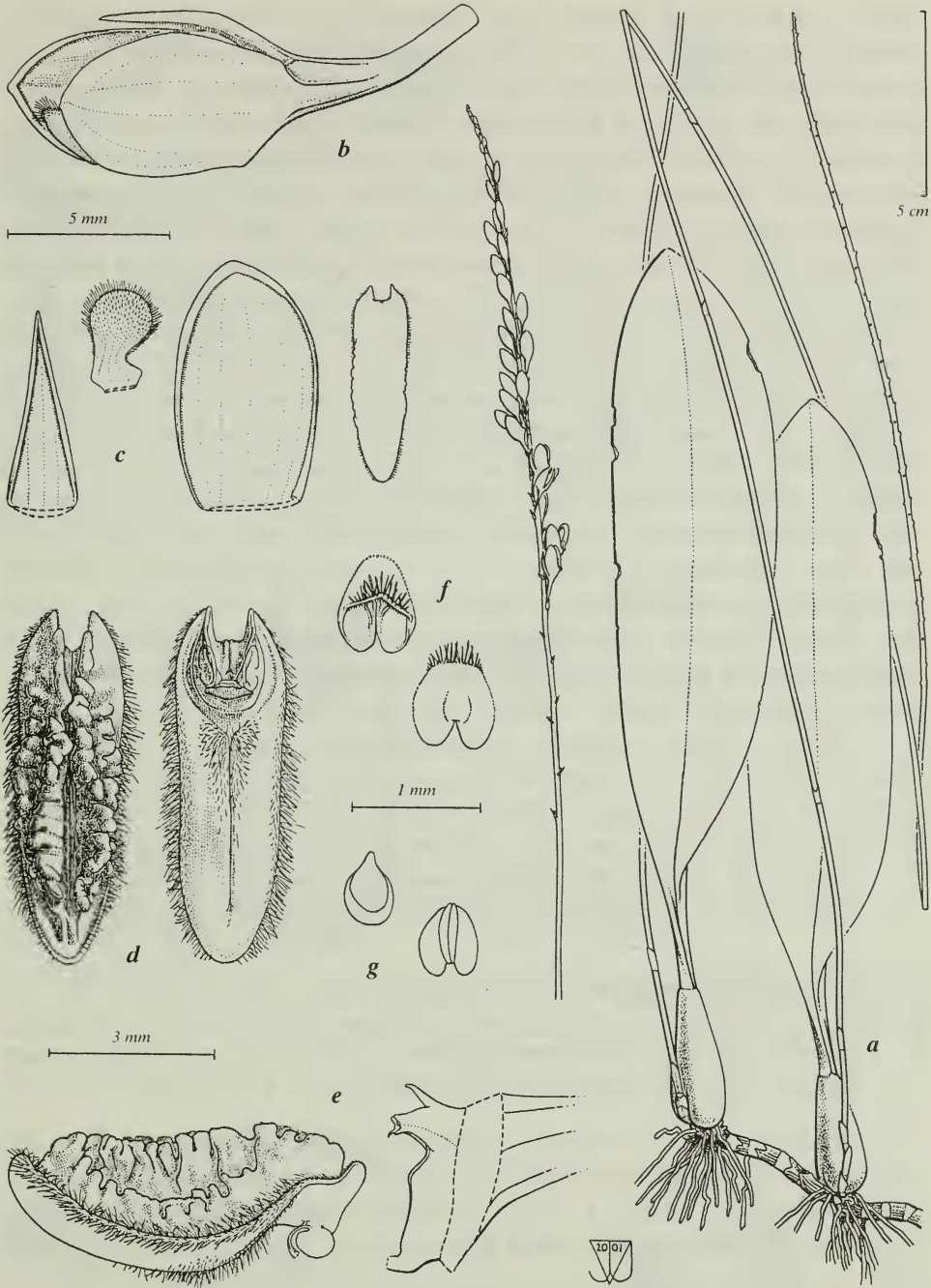


Figure 40. *Bulbophyllum polygaliflorum* J.J. Wood (150)

longest 10 mm long. *Rhachis* not thickened, 15–18 cm long, glabrous. *Floral bracts* ovate, 2–3 x 1.5–2 mm, acuminate. *Flowers* not fully opening, several simultaneously. *Pedicel* and *ovary* 5–6.5 mm long, basal node $\pm$ flush with the surface of the rhachis. *Median sepal* $\pm$ porrect, triangular, 6–6.4 x 1.5–2.4 mm, index 2.6–4; acute to acuminate, margins ciliolate, base broadly attached; thick, surface glabrous. *Lateral sepals* somewhat recurved, ovate to elliptic, 7.5–9 x 4.8–5 mm, index 1.5–1.8; obtuse, otherwise as the median sepal. *Petals* porrect, spathulate with a widened base, 3–3.5 x c. 2 mm, index 1.5–1.8; rounded, margins ciliate, base rather broadly attached; rather thick, surface hirsute towards the tip. *Lip* recurved near the base, elliptic to ovate, 6–6.8 x 2–2.5 mm, index 2.7–3; obtuse, margins densely ciliate; very thick; adaxially concave near the base, with a median slit over most of its length, with 4 rows of irregularly shaped, fleshy calli, the two inner rows higher and longer than the two outer, adaxial surface finely and shortly hirsute; abaxially with a rounded ridge near the base, surface otherwise convex with a median slit, pubescent in the centre and along the margins. *Column* 1–1.2 mm long, column foot with two longitudinal, rounded lamellae. *Stelidia* triangular, c. 0.5 mm long, acute, with a large, antrorse, deltoid, acute tooth along the upper margin, and a similar but much smaller, slightly falcate, triangular tooth along the lower. *Anther*: front margin ciliate, abaxial ridge papillose.

Colours: Sepals greenish, marked with pale purple, or purple, cilia white. Petals translucent near the base, blackish purple near the tip, cilia yellow. Lip greenish, upper surface with blackish green warts and yellow indument, sides with yellow cilia. Column whitish, spotted purple.

Habitat & ecology: Epiphyte in montane forest. Alt. 1700–1800 m.

Distribution: MALAYSIA: Sarawak (1 specimen seen). Sabah (2).

151. *Bulbophyllum ochthodes* J.J. Verm., sp. nov. – Fig. 41, plate 32.

Bulbophyllum ochthodes J.J. Verm., a *Bulbophyllo polygalifloro* labelli latere adaxiali tantum callis in seriebus duabus differt. – TYPE: Malaysia, further details unknown, *Hort. Singapore SBG-O 616* (SING, holo.; K, KLU, iso.).

Rhizome 4–7 mm diam., sections between pseudobulbs 2–6 cm long. *Pseudobulbs* distant, ovoid, 1.8–3.5 x 0.7–1.5 cm. *Petiole* 1–3.5 cm. *Leaf blade* elliptic, 7.5–14 x 2.7–4.5 cm, index (length/width) 2.6–4; acute. *Inflorescence* an elongated, rather dense raceme, $\pm$ erect, 26–58 cm, 40–

Figure 41. *Bulbophyllum ochthodes* J.J. Verm. (151) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, left: single pair, right: two pairs. – All from *Hort. Singapore SBG-O 616* (spirit sample).

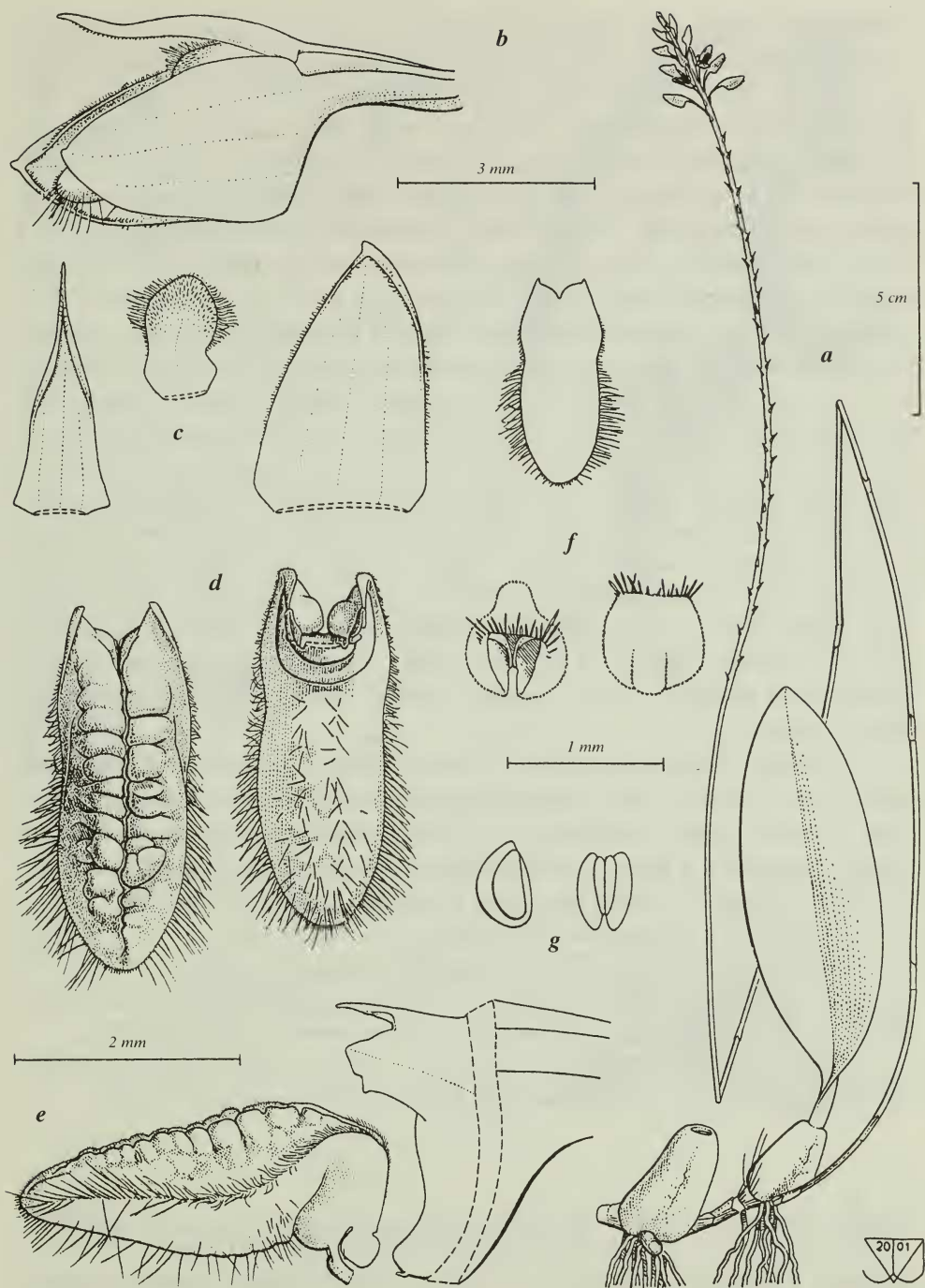


Figure 41. *Bulbophyllum ochthodes* J.J. Verm. (151)

60-flowered. *Peduncle* 19–46 cm, bracts c. 6, the longest 4.8–5.5 mm long. *Rhachis* not thickened, 6.5–12 cm long, glabrous. *Floral bracts* triangular, 1.8–2 x c. 1 mm, acute. *Flowers* not fully opening, few simultaneously. *Pedicel* and *ovary* 2.8–4 mm long, basal node on a 0.2–0.5 mm-long stump. *Median sepal* $\pm$ porrect, triangular, 3.8–4 x 1.5 mm, index 2.5–2.7; acuminate, margins ciliolate, base rather narrowly attached; thick, surface glabrous. *Lateral sepals* somewhat recurved, ovate, 4.5–5 x 2.8–3 mm, index c. 1.6; subacute, otherwise as the median sepal. *Petals* porrect, spatulate with a widened base, c. 2 x 1–1.1 mm, index c. 1.8; rounded, margins ciliate, base rather broadly attached; rather thin, surface hirsute towards the tip. *Lip* abruptly recurved near the base, elliptic-oblong, 3–3.1 x 1.2–1.5 mm, index 2–2.6; rounded, margins densely ciliate with the hairs thicker and $\pm$ stiff towards the tip; very thick; adaxially concave near the base, with a median slit over most of its length, with 2 rows of irregularly shaped, fleshy, finely and shortly hirsute calli, adaxial surface otherwise $\pm$ glabrous; abaxially with a rounded ridge near the base, surface otherwise convex with scattered, slightly stiff, thick hairs more or less arranged in two rows, surface otherwise glabrous. *Column* 1.2–1.3 mm long, stigma with an inconspicuous, slightly cleft basal callus, column foot swollen. *Stelidia* deltoid, c. 0.4 mm long, obtuse, with a small, deltoid, obtuse teeth along the lower margin. *Anther*: front margin ciliate, abaxial ridge papillose.

Colours: Peduncle dark red. Sepals reddish purple, pale yellowish green near the base, cilia along the margins white. Petals whitish near the base, blackish purple towards the tip, hairs blackish purple. Lip blackish purple except for a pale yellowish patch near the base abaxially, and the yellowish furrows between the warts adaxially. Column yellowish.

Habitat & ecology: Montane forest. Alt. c. 1500 m.

Distribution: MALAYSIA: Peninsula (1 specimen seen).

Notes: Most similar to *Bulbophyllum polygaliflorum*, but differs in the flowers having a shorter lip with only two rows of calli adaxially.

Only a single specimen is known, from a nursery in Cameron Highlands, Malaysia, which was said to have been collected locally.

Figure 42. *Bulbophyllum phreatiops* J.J. Verm. (152) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, above: adaxial side, below: abaxial side; e. Column and lip, lateral view; f. Anther, left: adaxial side, right: abaxial side; g. Pollinia, above: single pair, below: two pairs. – All from Hoogland & Craven 10899 (herbarium specimen).

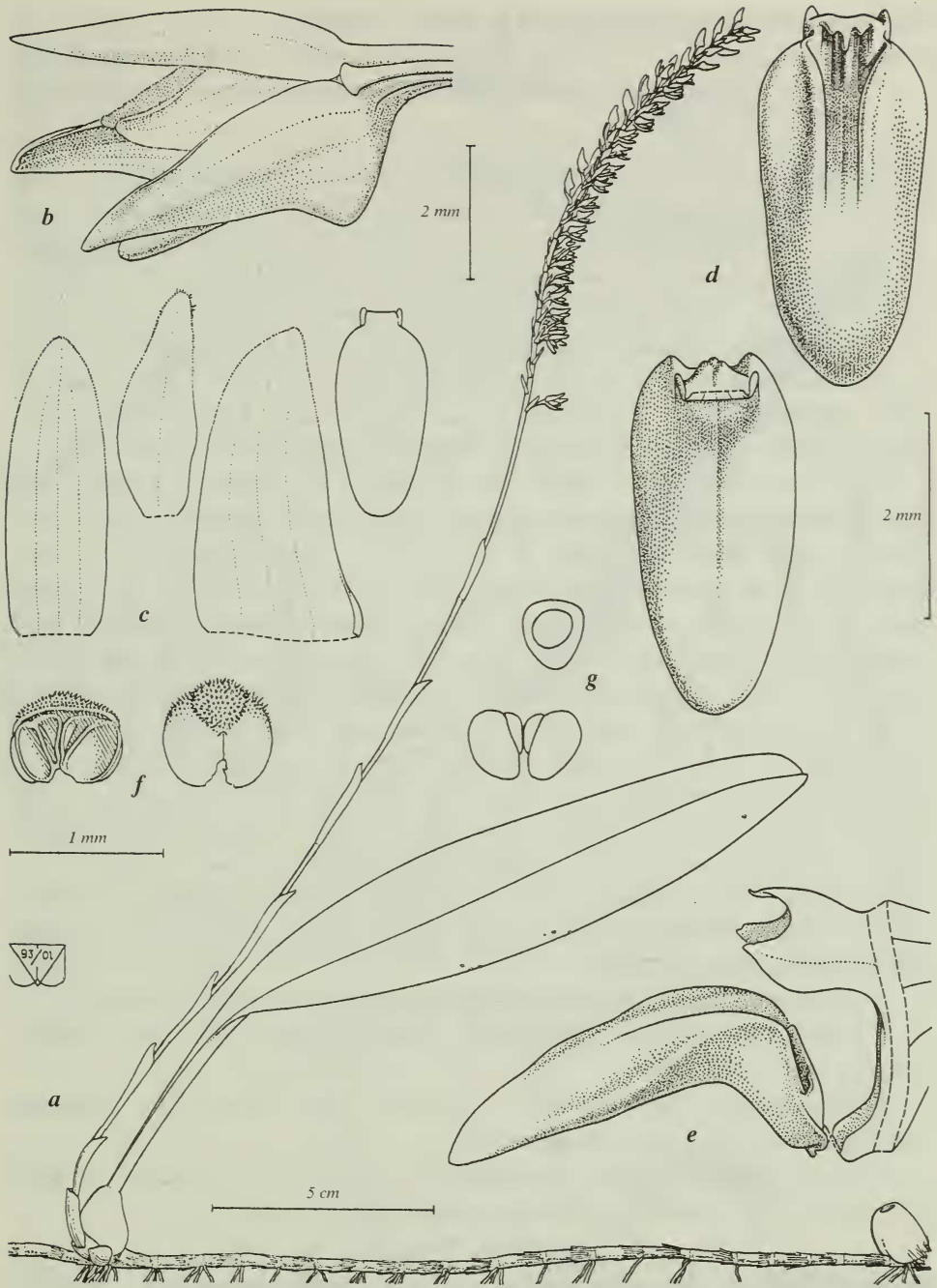


Figure 42. *Bulbophyllum phreatiopse* J.J. Verm. (152)

152. *Bulbophyllum phreatiopse* J.J. Verm. – Fig. 42.

Bulbophyllum phreatiopse J.J. Verm., *Blumea* 38 (1993) 151. – TYPE: Papua New Guinea, East Sepik District, Mt. Hunstein, Hoogland & Craven 10899 (L. holo., AMES. LAE iso.).

Rhizome 2.5–5 mm diam., sections between pseudobulbs 4–19 cm long. *Pseudobulbs* widely distant, ovoid, 1.2–1.8 x 0.8–1.2 cm. *Petiole* 3–5.5 cm. *Leaf blade* elliptic, 10–13.5 x 2–3.3 cm, index (length/width) 4.5–5.5; obtuse. *Inflorescence* an elongated, dense raceme, erect to patent, 27–35 cm, 40–55-flowered. *Peduncle* 18–26 cm, bracts 8–11, the longest 15–25 mm long. *Rhachis* not thickened, 7–13 cm long, glabrous. *Floral bracts* ovate, 2.5–5 x c. 2 mm, acute. *Flowers* secund, not fully opening, many simultaneously. *Pedicel* and *ovary* 1.8–3 mm long, basal node c. flush with the surface of the rhachis. *Median sepal* porrect, ovate to elliptic, c. 4.6–5.2 x 1.8–2 mm, index 2.5–3; obtuse to subacute, margins and adaxial surface finely papillose distally, base broadly attached; rather thin. *Lateral sepals* recurved, ovate, 5–5.5 x 2.5–3 mm, index 1.8–2, acute; otherwise as the median sepal. *Petals* porrect, ovate, 3–3.8 x 1.2–1.5 mm, index c. 2.5; obtuse, margins and adaxial surface papillose distally, base rather narrowly attached; rather thin. *Lip* recurved in the proximal half, ovate, 3–3.5 x 1–1.5 mm, index 2.3–3; rounded, thick, glabrous; adaxially concave near the base, and with a median ridge with a tooth on its crest and flanked by furrows, this median ridge proximally widening to a triangular callus forming a roof over the flanking furrows, in front of the median ridge two more ridges converging distally, adaxial surface distally convex; abaxially with a wide, retuse ridge towards the base. *Column* 1.5–1.8 mm long. *Stelidia* triangular, 0.6–0.9 mm long, tip acute: with or without a small, deltoid, obtuse tooth along the upper margin. *Anther*: front margin and abaxial ridge papillose.

Colours: Sepals and petals white. Lip white, or orange-yellow.

Habitat & ecology: Epiphyte in primary forest. Alt. 1300–1500 m. Flowering in Oct–Nov.

Distribution: PAPUA NEW GUINEA: East Sepik Dist., Southern Highlands District (2 specimens seen).

Notes: *Bulbophyllum phreatiopse* is tentatively included in sect. *Hirtula*, see the note below the description of the section.

Figure 43. *Bulbophyllum parviflorum* Par. & Rechb.f. in Rechb.f. (153) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Lip, adaxial side; f. Column and lip, lateral view; g. Anther, left: adaxial side, right: abaxial side; h. Pollinia, above: single pair, below: two pairs. – a. From Pantling 245 (herbarium specimen); b–d, f–h. From *Hort. Leiden* 960104 (spirit sample); e. From *GT* 8549 (spirit sample).

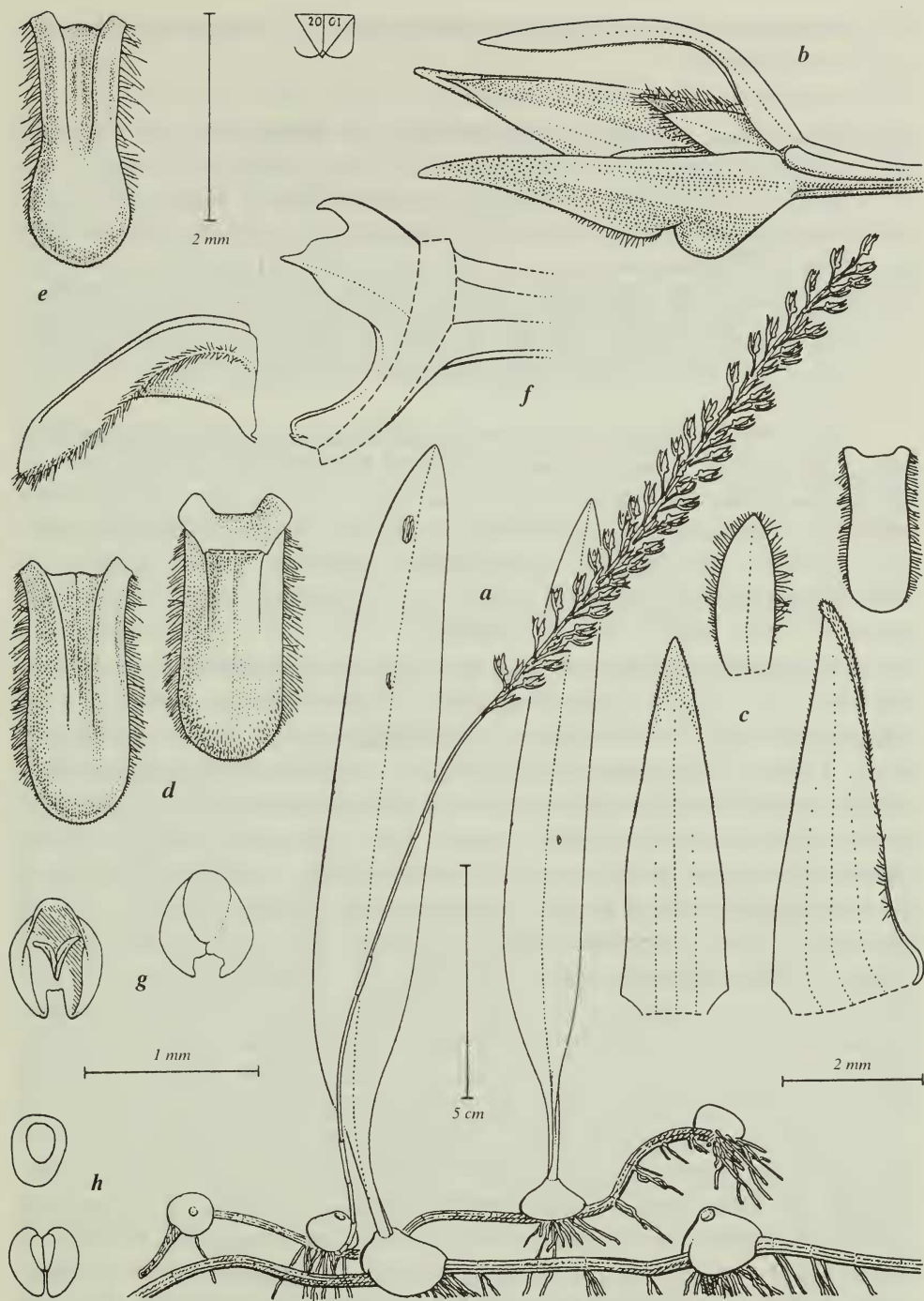


Figure 43. *Bulbophyllum parviflorum* Par. & Rchb.f. in Rchb.f. (153)

The original description of *B. phreatiopause* erroneously stated that the petals are 3-veined.

153. *Bulbophyllum parviflorum* Par. & Rchb.f. in Rchb.f. – Fig. 43, plate 33.

Bulbophyllum parviflorum Par. & Rchb.f. in Rchb.f., Trans. Linn. Soc. London, Bot. 30 (1874) 152. – *Phyllorchis parviflora* (Par. & Rchb.f. in Rchb.f.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 677. — TYPE: Myanmar, Tenasserim, *Parish* 305 (K, holo.; C, W, iso.).

Bulbophyllum thomsoni Hook.f., Fl. Brit. Ind. 5 (1890) 764; id., Hooker's Icon. Pl. 21 (1892) t. 2041; King & Pantling, Ann. Roy. Bot. Gard. (Calcutta) 8 (1898) 83, t. 116. – *Phyllorchis thomsonii* (Par. & Rchb.f. in Rchb.f.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 678. — TYPE: Sikkim, *Thomson s.n. (1850)* (K, holo.).

Rhizome 2.8–5 mm diam., sections between pseudobulbs 2–10 cm long. *Pseudobulbs* widely distant, depressed conical, 0.8–2 x 1.2–1.8 cm. *Petiole* 1–3 cm. *Leaf blade* ovate, 7.2–16 x 1.2–2.4 cm, index (length/width) 5.4–7.9; obtuse to acute. *Inflorescence* an elongated, dense raceme, erect to patent, 15–30 cm, 35–80-flowered. *Peduncle* 6–12 cm, bracts c. 6, the longest 9–14 mm long. *Rhachis* not thickened, 9.5–19.5 cm long, glabrous. *Floral bracts* ovate to triangular, 1.3–4 x 1–2 mm, acuminate. *Flowers* sometimes secund, not fully opening, many simultaneously. *Pedicel* and *ovary* 2.2–4 mm long, basal node $\pm$ flush with the surface of the rhachis or on a c. 0.2 mm-long stump. *Median sepal* porrect, triangular, 2.8–6 x 0.8–1.7 mm, index 2.4–3.8; acute, margins ciliolate, base rather broadly attached; rather thin, surface very finely papillose locally. *Lateral sepals* slightly recurved, 2.8–6.5 x 1.1–2.5 mm, index 1.5–3.2, upper margin glabrous to ciliolate, lower margin ciliolate to ciliate; otherwise as the median sepal. *Petals* porrect, (ob-)ovate to elliptic, 1.5–2.4 x 0.6–1 mm, index 1.8–3; obtuse to acuminate, margins ciliate, base rather broadly attached; thin, glabrous. *Lip* recurved in the proximal half, oblong to subspathulate, 1.7–2.5 x 0.8–1 mm, index 1.8–2.5; rounded, margins ciliate except near the tip; thick, surface finely papillose, or only so distally; adaxially concave near the base, without a basal callus, with 2–3 ridges, the lateral distinct, rather sharp, diverging proximally and continuing over c. 2/3 of the lip, the median ridge, if present, low, inconspicuous, rounded and continuing over 1/2 of the lip; abaxially with a wide, retuse ridge towards the base; basal auricles inconspicuous. *Column* 1–1.3 mm long. *Stelidia* triangular, 0.4–0.7 mm long, tip obtuse; with a deltoid, rounded to obtuse tooth along the upper margin, and often an inconspicuous, rounded wing along the lower margin, at the base. *Anther*: front margin glabrous, abaxial surface somewhat finely papillose.

Colours: Sepals and petals creamy white, the petals sometimes with red cilia. Lip white, yellow or green.

Habitat & ecology: Tropical forest. Alt. 400-1500 m. Flowering in Jul—Oct.

Distribution: BHUTAN (1). INDIA: Sikkim (3 specimens seen). MYANMAR: Moulmein (1). THAILAND (2).

Notes: The flower colour is partly copied from King & Pantling (1898).

On average, the Myanmar and Thailand specimens (including the type of *Bulbophyllum parviflorum*) are smaller in all parts than those from the eastern Himalayas (including the type of *B. thomsoni*). As far as can be ascertained from herbarium material, they also have a more distinct median ridge on the adaxial side of the lip. Distinction of subspecies, however, is impossible with the material now available.

154. *Bulbophyllum secundum* Hook.f. – Fig. 44, plate 34, 35.

Bulbophyllum secundum Hook.f., Fl. Brit. Ind. 5 (1890) 764; id., Hooker's Icon. Pl. 21 (1892) t. 2042; Seidenf., Dansk Bot. Ark. 33, 3 (1979) 103 (partly, excl. syn. *B. nigripetalum* [is *B. nigripetalum*]). – *Phyllorchis secunda* (Hook.f.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 678. – TYPE: India, Naga Hills, *Prain 41* (K, holo.).

Bulbophyllum subparviflorum Z.H. Tsi & S.C. Chen, Acta Phytotax. Sin. 32 (1994) 555. – TYPE: China, Yunnan, Menghai, *Tsi 91-544* (PE, holo.; K, iso.)

Rhizome 0.8—1.2 mm diam., sections between pseudobulbs 0.5—1.8 cm long. *Pseudobulbs* close, depressed conical to lenticular, 0.4—1 x 0.6—1.5 cm. *Petiole* 0.7—1.5 cm. *Leaf blade* elliptic, 3.2—10 x 0.4—1 cm, index (length/width) 5—12.5; obtuse to acute. *Inflorescence* an elongated, rather lax raceme, erect, 7.5—22 cm, 8—23-flowered. *Peduncle* 5—13.2 cm, bracts c. 4, the longest 2—4.5 mm long. *Rhachis* not thickened, 2.2—11 cm long, glabrous. *Floral bracts* triangular, 1—1.8 x 0.8—1.2 mm, acute to acuminate. *Flowers* distichous or scattered, resupinate, secund, not fully opening, several simultaneously. *Pedicel* and *ovary* 1.8—6 mm long, basal node $\pm$ flush with the surface of the rhachis or on a c. 0.3 mm-long stump. *Median sepal* $\pm$ porrect, ovate to triangular, 2—3.2 x 0.9—1.3 mm, index 2.1—2.5; obtuse to acute, margins ciliolate, base rather narrowly attached; rather thin, surface glabrous. *Lateral sepals* recurved, triangular, 2.2—3.8 x 1.3—2.2 mm, index 1.4—1.9; (sub-)acute, upper margin glabrous to sparsely ciliolate; otherwise as the median sepal. *Petals* porrect, obovate to spatulate, 1.5—2.2 x 0.6—0.8 mm, index 2.2—3; rounded to obtuse, margins ciliate, base broadly attached; thin, glabrous or slightly papillose towards the tip. *Lip* recurved in the proximal half, ovate, 1.8—3 x 0.9—1.2 mm, index 1.8—2.8; rounded, margins ciliate except near the tip; thick; adaxially slightly concave near the base and with a deeply cleft, triangular basal callus, with 2 very weak, rounded ridges diverging proximally and fused to a single slightly convex body in the distal half of the lip, surface finely papillose to shortly pubescent proximally and glabrous distally; abaxially with an inconspicuous, retuse

ridge towards the base, surface glabrous. *Column* 1.1—1.3 mm long. *Stelidia* triangular, 0.3—0.5 mm long, tip acute; with or without an often antrorse, deltoid to triangular, obtuse to acute tooth along the upper margin, with or without a deltoid, rounded to obtuse wing along the lower margin, at the base. *Anther*: front margin papillose, abaxial surface papillose distally.

Colours: Sepals pale green, often suffused with dull reddish brown or purple towards the tip, or almost entirely of that colour except for the base. Petals pale green, similarly suffused with reddish brown or purple; hairs purple. Lip reddish purple, or brownish green, proximally dark brown along the margins. Column greenish, often dark brownish or purplish at the foot. Flowers also reported to be light blue (unlikely, see *Samuel 13549*) or pink (*Grey-Wilson & Phillips 93*).

Habitat & ecology: Epiphyte in montane temperate or tropical evergreen (shrub) forests; also reported from depleted evergreen forest. Alt. 1200-2500 m. Flowering in Jan, Feb, May—Jul, Sep.

Distribution: CHINA: Yunnan (1 specimen seen). NEPAL (2). INDIA: Sikkim (1); Assam (1); Naga Hills (1). MYANMAR: (1); northern part (2). THAILAND (4). VIETNAM: southern part (1).

Notes: Seidenfaden (1979) has confused this with *Bulbophyllum nigripetalum*; see the note under the latter.

155. *Bulbophyllum deprincatae* J.J. Verm., *sp. nov.* – Fig. 45, plate 36.

Bulbophyllum deprincatae J.J. Verm., a *Bulbophyllo piloso* in calcari brevi e sepalorum lateralium basi protrudenti, labelli parte apicali pilis longis differt. – TYPE: Philippines, Luzon, Nueva Viscaya, *Debrincat*, *B. cult.* (leg. Cootes, J.E.) 001 (SING, holo.).

Rhizome 3—4 mm diam., sections between pseudobulbs 1.2—1.6 cm long. *Pseudobulbs* close, ovoid, 1.3—2.5 x 1—1.6 cm. *Petiole* 2—3.5 cm. *Leaf blade* ovate-elliptic, 9.2—14.5 x 3.3—5 cm, index (length/width) 2.7—2.9; rounded. *Inflorescence* an elongated, rather dense raceme, erect, c. 43 cm, c. 34-flowered. *Peduncle* c. 24.5 cm, bracts c. 5 (4 present on portion of inflorescence available), the longest c. 10 mm long. *Rhachis* slightly thickened, c. 15 x 0.3 cm, finely papillose. *Floral bracts* triangular, c. 2.2 x 1.2 mm, acute to acuminate. *Flowers* secund, not fully opening, several simultaneously, anthesis from the top of the rhachis downwards. *Pedicel* and *ovary* c. 5.5 mm long, finely papillose distally, basal node ± flush with

Figure 44. *Bulbophyllum secundum* Hook.f. (154) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, above: single pair, below: two pairs. – a. From *Jongejan s.n.* (living plant); b—g. From *Jongejan cult. 889* (spirit sample).

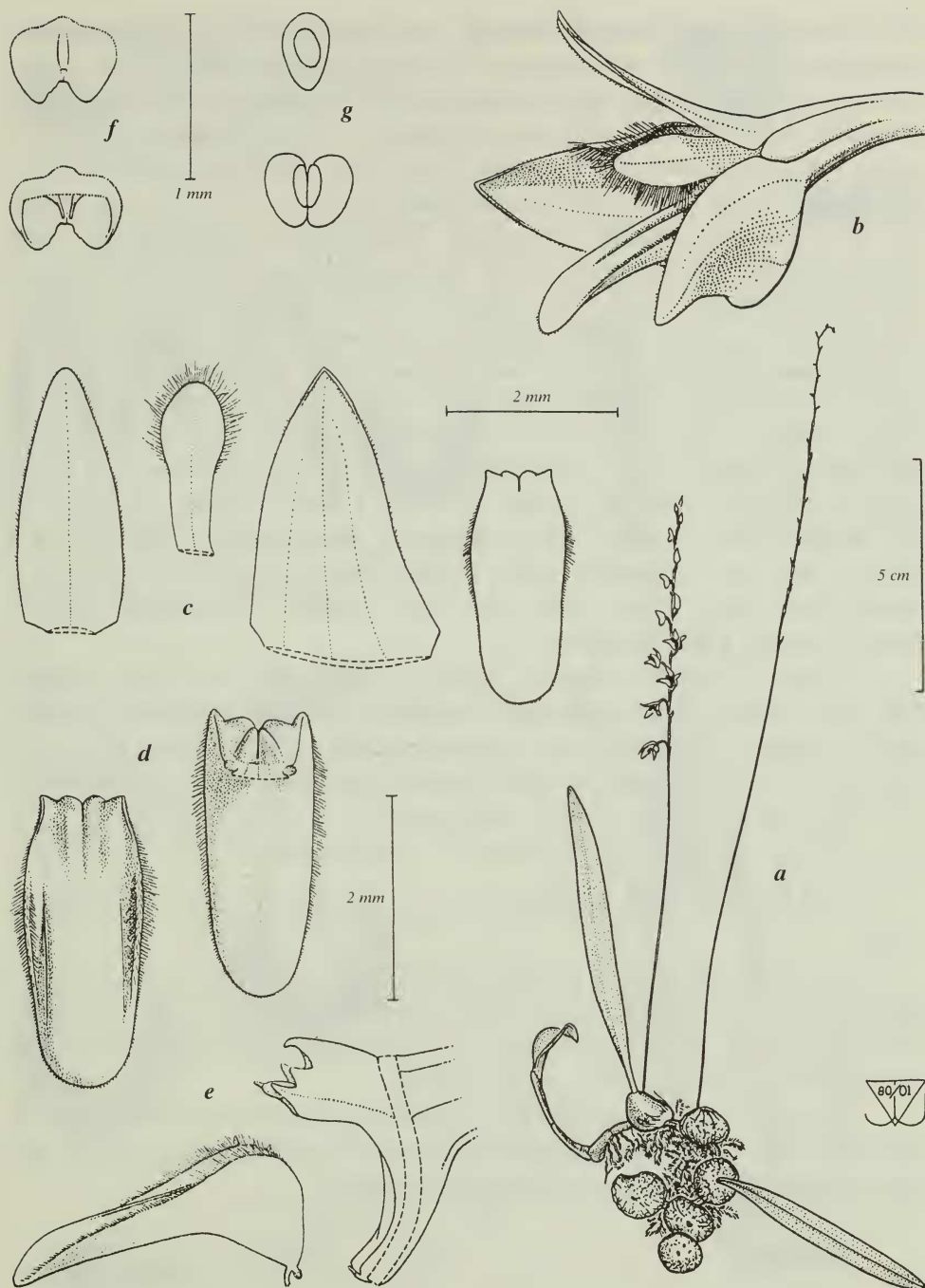


Figure 44. *Bulbophyllum secundum* Hook.f. (154)

the surface of the rhachis. *Median sepal* porrect to recurved, ovate-triangular, c. 7.5 x 2.2 mm, index c. 3.4; acute, margins ciliate, base rather broadly attached; rather thick, surface glabrous adaxially, finely papillose abaxially. *Lateral sepals* recurved, triangular, c. 7.5 x 3.6 mm, index c. 2.1, upper margin ciliolate with scattered longer hairs in between; otherwise as the median sepal. *Petals* porrect, triangular-ovate, c. 3.4 x 1.4 mm, index 2.4—2.5; subacute, margins long ciliate, hairs longer towards the tip, base rather broadly attached; rather thin, surface glabrous. *Lip* curved close to the base, oblong, c. 7.5 x 2 mm, index 3.7—3.8; rounded, margins ciliolate proximally, long ciliate distally, glabrous in between; thick; adaxially slightly concave near the base, without a basal callus, with a median furrow reaching up to c. 1/4 of the lip, slightly convex elsewhere, surface glabrous; abaxially with a rounded ridge near the base, surface slightly convex, glabrous but with a finely pubescent patch in front of the basal ridge. *Column* c. 1.8 mm long, foot slightly swollen, abaxial side with a short, obtuse spur near the tip. *Stelidia* c. 0.8 mm long, acute, obliquely rectangular in outline with a distinct, antrorse, triangular, acute tooth along the upper margin, and a similar, but obtuse tooth along the lower. *Anther*: front margin pilose, abaxial surface finely papillose.

Colours: Rhachis yellowish, slightly suffused with red. Bract, pedicel and ovary yellowish green, marked brownish red distally. Sepals yellowish green, marked with dark red (appearing almost black) along veins and margins; hairs around edge greyish. Petals similarly coloured, hairs blackish. Lip shiny black, hairs greyish. Column green with black blotches.

Habitat & ecology: Epiphyte in montane forest. Alt. c. 1200 m. Flowering in cultivation in Oct.

Distribution: PHILIPPINES: Luzon, Nueva Viscaya (1 specimen seen).

Notes: *Bulbophyllum deprincatae* is most similar to *B. pilosum*, but differs in having triangular-ovate petals, glabrous margins along the middle section of the lip, and a remarkable, small, obtuse papillose spur protruding from between the base of the lateral sepals.

Named in honour of Mrs Bev Debrincat, who acquired the plant, as part of Mr Jim Cootes's orchid collection from the Philippines in 1998, and who was the first to flower it in cultivation.

Figure 45. *Bulbophyllum deprincatae* J.J. Verm. (155) — a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, left: single pair; right: two pairs. — All from *Debrincat*, *B. cult.* (leg. Cootes, J.E.) 001 (Photographs, notes from J. Cootes, spirit sample).



Figure 45. *Bulbophyllum deprincatae* J.J. Verm. (155)

156. *Bulbophyllum pilosum* J.J. Verm., sp. nov. – Fig. 46.

Bulbophyllum pilosum J.J. Verm., a *Bulbophyllo lasioglosso* in sepalis lateralibus ciliatis, stigmatis basi sine callo bifido differt. – TYPE: Malaysia, Sabah, Ulu Padas, Vermeulen 562 (L, holo.).

Rhizome 1.5–2 mm diam., sections between pseudobulbs 0.4–0.7 cm long. *Pseudobulbs* touching, ovoid, 1.4–2.5 x 0.6–0.9 cm. *Petiole* 2–3.2 cm. *Leaf blade* elliptic to ovate, 11–13 x 2–2.5 cm, index (length/width) 5.2–5.8; acute. *Inflorescence* an elongated, rather dense raceme, c. 19 cm, c. 10-flowered. *Peduncle* ± patent, c. 17 cm, bracts c. 5, the longest c. 4 mm long. *Rhachis* not thickened, nodding, c. 2 cm long, glabrous. *Floral bracts* triangular, c. 1.6 x 1 mm, acuminate. *Pedicel* and *ovary* c. 6 mm long, basal node on a c. 0.2 mm-long stump. *Median sepal* porrect to ?recurved, triangular, c. 5.8 x 2.1 mm, index 2.3–2.4; acute-acuminate, margins with long hairs, base rather broadly attached; rather thin, surface glabrous. *Lateral sepals* ?recurved, ovate, c. 7.3 x 3.1 mm, index 2.3–2.4; subacute, otherwise as the median sepal. *Petals* porrect, obovate, c. 3.3 x 1.8 mm, index 1.8–1.9; rounded, margins long ciliate, hairs longer towards the tip, base rather broadly attached; rather thick, surface glabrous. *Lip* curved in the proximal half, obscurely 3-lobed; *midlobe* ovate, c. 4.2 x 1.8 mm, index 2.3–2.4; rounded, margins with long, thin, wavy hairs; rather thin with a thick base, surface glabrous; adaxially concave near the base, without a basal callus, with a median slit reaching up to 1/2 of the lip, with two obtuse ridges diverging proximally towards the distal end of the lateral lobes, distally thick and together forming a small callus continuing over c. 1/4 of the lip, surface otherwise ± flat; abaxially with a wide, retuse ridge near the base; *lateral lobes* attached along the proximal 1/4–1/5 of the lip, erect, semi-circular, margins ciliate, broadly attached, rather thin, surface glabrous. *Column* c. 1.5 mm long, foot slightly swollen. *Stelidia* c. 1 mm long, acute, obliquely rectangular in outline with a distinct, antrorse, triangular, acute tooth along the upper and lower margin.

Colours: Perianth on top of a fruit purplish.

Habitat & ecology: Understorey epiphyte in tall forest on leached sandstone soil. Alt. 1300–1500 m. Fruiting in Oct.

Distribution: MALAYSIA. Sabah, Ulu Padas (1 specimen seen).

Notes: The floral details have been reconstructed from the perianth persistent on an almost mature fruit. Some details may be inaccurate.

Most similar to *Bulbophyllum lasioglossum*; the latter differs in having

Figure 46. *Bulbophyllum pilosum* J.J. Verm. (156) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view. – All from Vermeulen 562 (herbarium specimen).

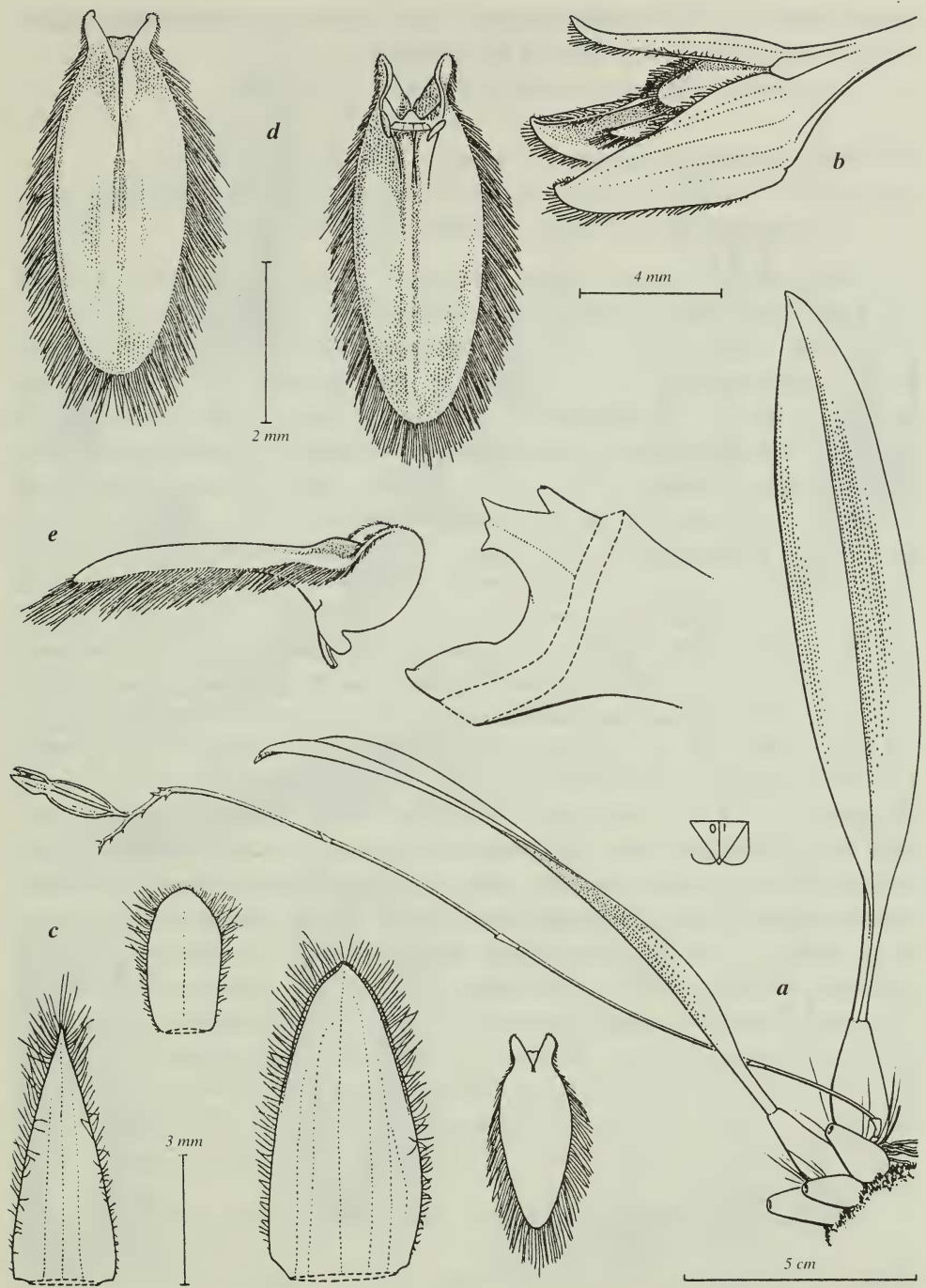


Figure 46. *Bulbophyllum pilosum* J.J. Verm. (156)

lateral sepals with glabrous margins, much narrower, acute petals, and a deeply bifid callus at the base of the stigma.

The name refers to the pilose sepals.

157. *Bulbophyllum xenosum* J.J. Verm. – Fig. 47, plate 37.

Bulbophyllum xenosum J.J. Verm., Blumea 41 (1996) 353. – TYPE: Brunei, Temburong, upper zone of Bukit Belalong, *Jongejan cult.* 4425 (L. holo.).

Rhizome 2.5–3 mm diam., sections between pseudobulbs 1.5–4.5 cm long. *Pseudobulbs* distant, depressed-conical to lenticular, 1.2–1.7 x 1–1.4 cm. *Petiole* 1.2–2 cm. *Leaf blade* elliptic, 8.5–13 x 0.8–1.2 cm, index (length/width) 10–11; subacute. *Inflorescence* an elongated, lax raceme, c. 44 cm, c. 30-flowered. *Peduncle* patent, c. 19 cm, bracts c. 4, the longest 5 mm long. *Rhachis* not thickened, arching, c. 25 cm long, glabrous. *Floral bracts* triangular, 2–2.5 x c. 1 mm, acute. *Flowers* imperfectly distichous but scattered at the base and the tip of the rhachis, secund, many open simultaneously, fully open. *Pedicel* and *ovary* 4.5–5 mm long, basal node on a c. 0.3 mm-long stump. *Median sepal* porrect to recurved, ovate, c. 11 x 1.5 mm, index 7–8; acute, margins ciliate, base rather broadly attached; rather thin, surface glabrous. *Lateral sepals* recurved, triangular, 9.5–10 x c. 2.2 mm, index 4.3–4.6; upper margin glabrous, base broadly attached; otherwise as the median sepal. *Petals* porrect, obovate, c. 1.5 x 0.8 mm, index 1.8–1.9; acute, margins long ciliate towards the tip, base broadly attached; thin, surface glabrous. *Lip* curved near the base, ovate-triangular, c. 5.5 x 1.5 mm, index 2.6–2.7; obtuse, margins slightly erose, with long, straight, rather thin hairs increasing in length and thickness towards the tip of the lip; lip rather thin, base thick; adaxially slightly concave near the base, without a basal callus, with a median slit continuing over about 1/3 of the lip, surface otherwise flat or somewhat convex, glabrous; abaxially with a retuse ridge near the base, surface otherwise flat or somewhat convex, glabrous except for two longitudinal rows of hairs about half-way up the lip. *Column* c. 2.2 mm long. *Stelidia* falcate, triangular, c. 0.9 mm long, tip acute; with an inconspicuous, deltoid, acute tooth along the upper margin, and an inconspicuous, deltoid, broadly rounded wing along the lower margin. *Anther*: front margin long ciliate, abaxial ridge with hairs.

Colours: Rhachis, pedicel and ovary suffused with reddish purple.

Figure 47. *Bulbophyllum xenosum* J.J. Verm. (157) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: abaxial side, right: adaxial side; e. Column and lip, lateral view; f. Anther, above: abaxial side, below: adaxial side; g. Pollinia, left: two pairs, right: single pair. – All from *Jongejan cult.* 4425 (spirit sample).

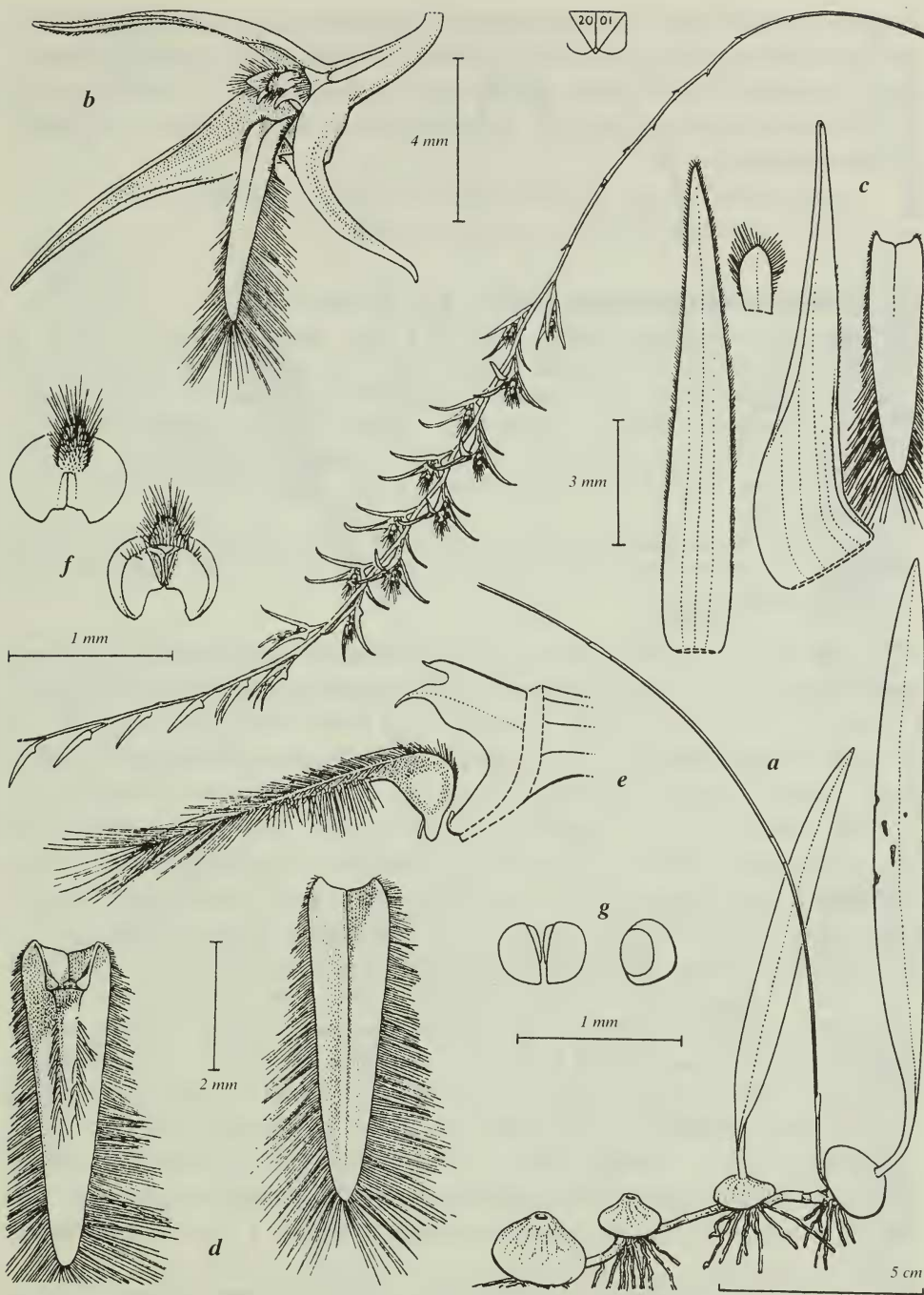


Figure 47. *Bulbophyllum xenosum* J.J. Verm. (157)

Sepals greenish white, abaxially suffused with pale purple, adaxially heavily stained with purple and with large, blackish purple blotches. Lip yellowish white, suffused with reddish purple towards the margins, and with large, more or less transverse blackish purple blotches; hairs reddish at the base, yellow towards the tip.

Habitat & ecology: Primary forest. Alt. 650—900 m.

Distribution: BRUNEI (1 specimen seen).

158. *Bulbophyllum limbatum* Lindl. – Fig. 48, plate 38.

Bulbophyllum limbatum Lindl., Edward's Bot. Reg. 26, misc. (1840) 74 ("Bolbophyllum"); J.J. Smith, Repert. Spec. Nov. Regni Veg. 32 (1932) 305; Seidenfaden, Dansk Bot. Ark. 33, 3 (1979) 100. — *Phyllorchis limbata* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 (1891) 677. – TYPE: Singapore. *Loddiges* (K. holo.).

Bulbophyllum blepharosepalum Schltr. Bull. Herb. Boiss. s. 2, 6 (1906) 462. – TYPE: Indonesia, Sumatra, Indragiri, Sungei Lalah, *Schlechter 13241* (B. holo., destroyed).

[Not *Bulbophyllum limbatum sensu* Par. & Rchb.f. in Rchb.f., Trans. Linn. Soc. London. Bot. 30 (1874) 152 (= *B. rufilabrum* Par. ex Hook.f., sect. *Careyana*, fide Seidenfaden 1979).]

Rhizome 2—4 mm diam., sections between pseudobulbs 2—26 cm long. *Pseudobulbs* (widely) distant, ovoid to depressed-conical or lenticular, 1—2.5 x 1.2—2.5 cm. *Petiole* 1—4 cm. *Leaf blade* ovate, 7.5—16 x 2—3.7 cm, index (length/width) 3.1—5.3; acute. *Inflorescence* an elongated, rather dense raceme, erect to patent, 6.5—26 cm, 7—22-flowered. *Peduncle* 5—16.5 cm, bracts 5—6, the longest 4.5—6 mm long. *Rhachis* not thickened, 1.4—10 cm long, glabrous. *Floral bracts* triangular, not clasping the rhachis, 1.2–1.5 mm long, acute. *Flowers* scattered, secund, not opening fully, many simultaneously. *Pedicel* and *ovary* 45—6.2 mm long, basal node on a 0.2—0.4 mm-long stump. *Median sepal* porrect, ovate, 4—6.5 x 1.8—3.4 mm, index 1.5—2.6; obtuse to acute, margins ciliate, base broadly attached; rather thin, surface glabrous or finely papillose locally. *Lateral sepals* recurved, ovate-triangular, 4.8—7.5 x 2.5—5 mm, index 1.1—2.2; obtuse to acuminate, upper margin slightly papillose; otherwise as the median sepal. *Petals* porrect, elliptic to spatulate, 2.4—3.8 x 1—1.9 mm, index 1.7—2.8; rounded to obtuse, margins ciliate distally, base broadly attached; rather thin, surface finely papillose to pubescent distally, otherwise glabrous. *Lip* curved near the base, (ob-)ovate to elliptic, 3.5—6 x 1.2—3 mm, index

Figure 48. *Bulbophyllum limbatum* Lindl. (158) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: abaxial side, right: adaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, left: two pairs, right: single pair. – a. From *Jongejan cult. 3995* (spirit sample); b—g. From *Hort. Leiden 960104a* (spirit sample).

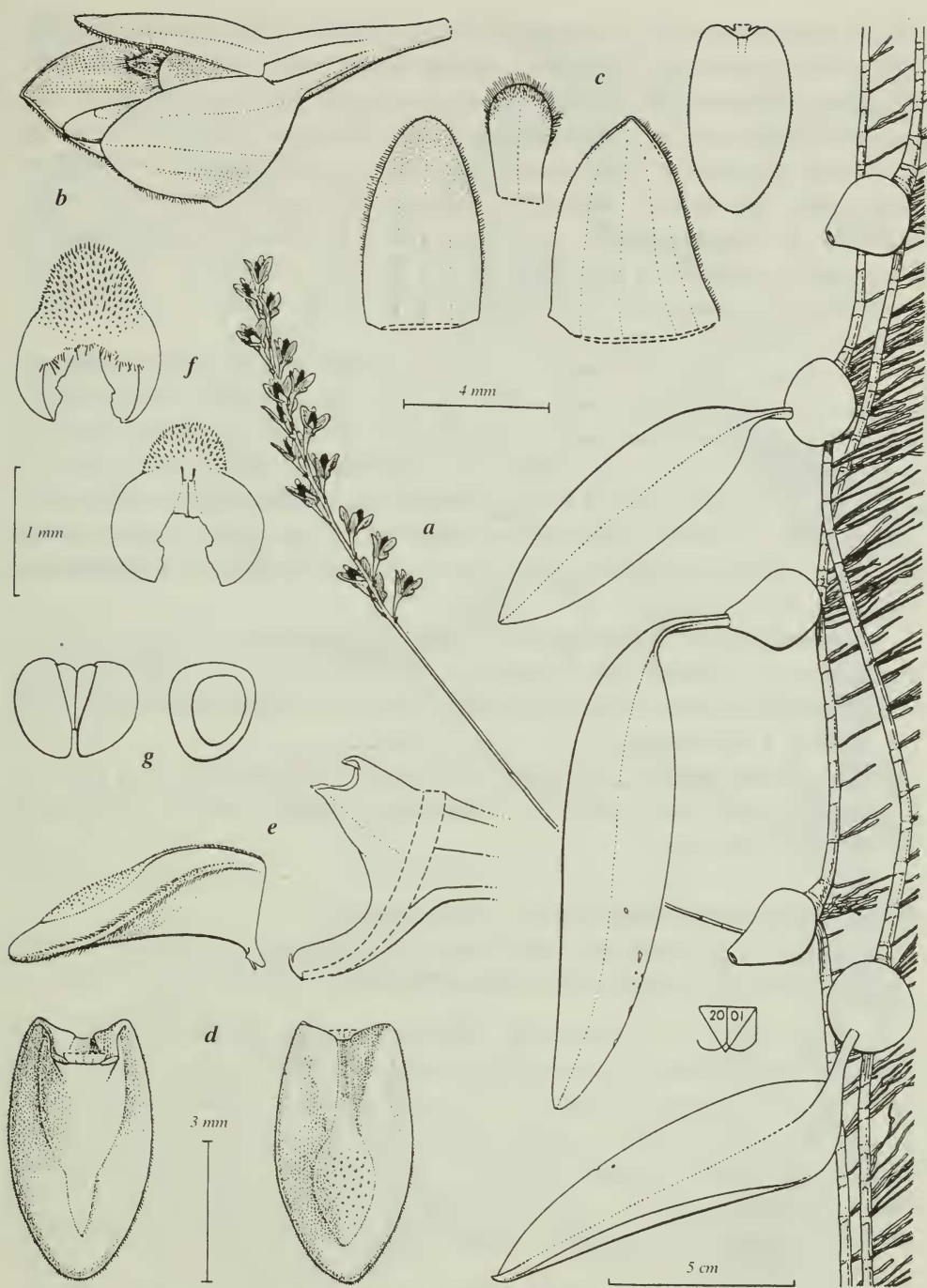


Figure 48. *Bulbophyllum limbatum* Lindl. (158)

1.6—3; rounded to obtuse, margins papillose distally; thick; adaxially slightly concave near the base, without a basal callus, with two inconspicuous, rounded, sometimes finely pubescent, proximally diverging ridges in the proximal 1/3 of the lip, with a median strip widening c. half-way up the lip into a vaguely outlined, large, somewhat convex, ovate, glabrous or papillose patch, with the surface otherwise glabrous proximally and often finely papillose or hirsute distally; abaxially with a $\pm$ truncate ridge near the base, surface otherwise slightly concave, glabrous. *Column* 1.7—2.3 mm long, *Stelidia* triangular, 0.4—0.8 mm long; acute. *Anther*: front margin erose and fimbriate, abaxial ridge papillose.

Colours: Sepals yellowish to greenish, with reddish-purple veins and margin, proximally often with a few purplish blotches; cilia white. Petals yellowish, with a reddish purple vein and margins; proximally often with a purplish blotch. Lip bright yellow, or reddish purple, adaxially with a yellowish or whitish median line, abaxially with a yellowish to white base.

Habitat & ecology: Rainforest; also in low and open *kerangas* forest and similar forest on ultrabasic soil. Alt.: sea level to 1000 m. Flowering in Jan, Apr, Aug, Oct, Nov.

Distribution: THAILAND (*fide* Seidenfaden). MALAYSIA: Peninsula (6); Sarawak (4); Sabah (4). SINGAPORE (1). BRUNEI (1). INDONESIA: Sumatra (*fide* Schlechter); Riau Archipelago, Bangka (*fide* J.J. Smith); Kalimantan (1).

Note: The flowers are almost identical to those of the next species. The differences between the two are mainly in the vegetative parts, and the mode of anthesis.

159. *Bulbophyllum rariflorum* J.J. Sm. – Fig. 49.

Bulbophyllum rariflorum J.J. Sm., Bull. Dep. Agric. Indes Neerl. 15 (1908) 20. – TYPE: Indonesia, Kalimantan, Pontianak, *Hort. Bogor s.n.* (BO, holo., not seen).

Rhizome 1.7—2.7 mm diam., sections between pseudobulbs 0.8—9.5 cm long. *Pseudobulbs* close to widely distant, depressed-conical to lenticular, 0.7—1.2 x 1.2—1.8 cm. *Petiole* 1—2.6 cm. *Leaf blade* elliptic to ovate, 7—14 x 0.8—1.6 cm, index (length/width) 6.5—10; acute. *Inflorescence* an elongated, very lax raceme, patent, 11—41 cm, 1—9-flowered. *Peduncle* 10.6—32.5 cm, bracts 3—4, the longest 3—5 mm long. *Rhachis* not thickened, slightly arching, 0.4—9.5 cm long, glabrous. *Floral bracts* tubular,

Figure 49. *Bulbophyllum rariflorum* J.J.Sm. (159) – a. Habit; b. Flower; c. Flower analysis, from left to right: median sepal, petal, lateral sepal, lip; d. Lip, left: adaxial side, right: abaxial side; e. Column and lip, lateral view; f. Anther, above: adaxial side, below: abaxial side; g. Pollinia, above: two pairs, below: single pair. – All from *Jongejan cult. 2214* (spirit sample).

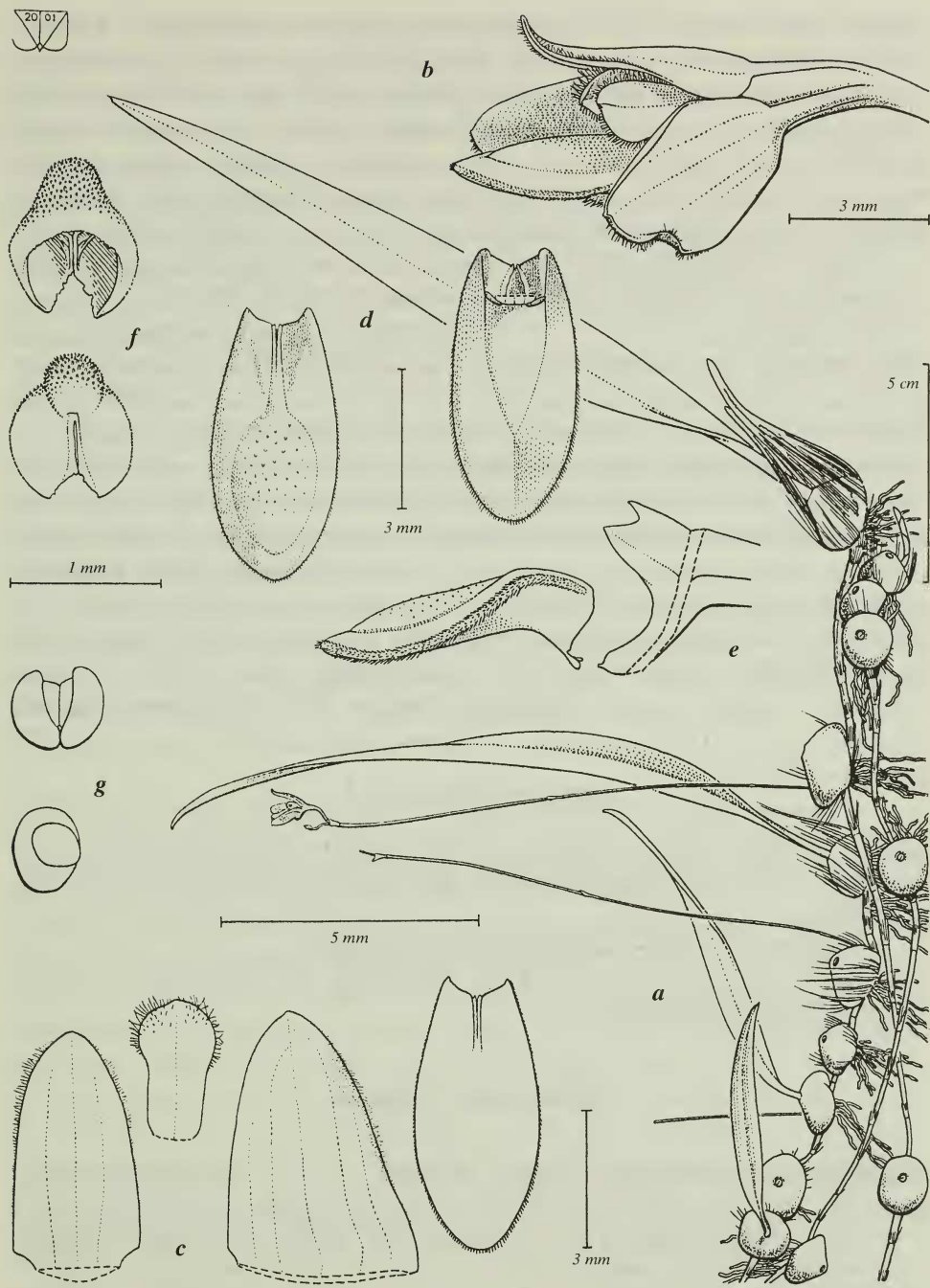


Figure 49. *Bulbophyllum rariflorum* J.J.Sm. (159)

clasping the rhachis, 1.8—2.9 mm long, acute to acuminate. *Flowers* imperfectly distichous or scattered, not opening fully, each one developing only after anthesis of the previous. *Pedicel* and *ovary* 5—5.6 mm long, basal node on a c. 0.4—0.7 mm-long stump. *Median sepal* porrect, ovate, 5—6.3 x 2—2.8 mm, index 1.9—2.5; rounded to obtuse, margins ciliate, base rather broadly attached; rather thin, adaxial surface finely papillose distally, otherwise glabrous. *Lateral sepals* recurved, ovate-triangular, 5.3—7.2 x 2.8—4 mm, index 1.4—2.2; obtuse to acute, upper margin slightly papillose, base broadly attached; otherwise as the median sepal. *Petals* porrect, spatulate, 3—3.2 x 1.5—2 mm, index 1.5—2; rounded, margins ciliate distally, base rather broadly attached; thin, adaxial surface finely papillose distally, otherwise glabrous. *Lip* curved near the base, obovate to elliptic, 5.2—6.8 x 2.5—3.3 mm, index 2—2.3; rounded, margins papillose-ciliolate distally; thick; adaxially slightly concave near the base, without a basal callus, with a median slit continuing over about 1/4 of the lip, with two inconspicuous, rounded, proximally diverging ridges in the proximal 1/3 of the lip, with a median strip widening c. half-way up the lip into a vaguely outlined, large, somewhat convex, ovate, glabrous or papillose patch, with the surface otherwise glabrous proximally and often finely papillose or hirsute distally; abaxially with a $\pm$ truncate ridge near the base, surface otherwise slightly concave, glabrous. *Column* 1.5—2 mm long, *Stelidia* triangular, 0.5—0.6 long; acute. *Anther*: front margin erose, abaxially papillose distally.

Colours: Sepals yellowish, distally with purplish veins, proximally with a purplish blotch. Petals yellowish, suffused purplish distally. Lip adaxially yellow or purplish with a dark purple median line, abaxially yellowish.

Habitat & ecology: Lowland *kerangas* forest.

Distribution: MALAYSIA: Sarawak (2 specimens seen). INDONESIA: Kalimantan (1).

Species fere Cognita

***Bulbophyllum sarcoscapum* Teijsm. & Binn.** (probably extinct)

Bulbophyllum sarcoscapum Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indie 29 (1867) 242. — TYPE: Indonesia, Java, 'in forests of Mt. Madoer, near Bogor', (collector not indicated) (not seen).

Rhizome c. 2 mm diam., sections between pseudobulbs c. 3 cm long. *Pseudobulbs* distant, depressed-conical to depressed-globose. *Petiole* 2.2—3 cm. *Leaf blade* elliptic-obovate, 11—23 x 2.3—2.8 cm, index (length/

width) 4.7—9.1; acute to acuminate. *Inflorescence* an elongated, lax raceme, pendulous, 22—26 cm, c. 25-flowered. *Peduncle* c. 16 cm, bracts c. 5, the longest c. 12 mm long. *Rhachis* thickened, c. 0.8 cm diam., glabrous. *Floral bracts* ovate, c. 3 x 2 mm, acute. Pedicel and ovary c. 3 mm. *Flowers* opening wide. *Sepals* reflexed, c. 4 mm long, surface adaxially finely pubescent, abaxially glabrous. *Petals* much shorter, semi-orbicular, margins ciliate. *Lip* ?elliptic, c. 4 mm long, obtuse, margins with hairs; adaxially furrowed, surface glabrous; abaxially with long hairs from base to tip.

Colours: Inflorescence purple. Flowers with blackish purple hairs.

Habitat & ecology: Montane forest.

Distribution: INDONESIA: Java (1 specimen seen). Not collected since c. 1860.

Notes: No type material could be located, in spite of a search in LE and W, where some of the Teysmann collections are stored. A sterile specimen, *Zollinger 947*, from Bandung, Java (W) is likely to be the same species. The description above is compiled from Teijsmann & Binnendijk, and from the W specimen.

Bulbophyllum sarcoscapum is of uncertain taxonomic status; the chances ever to find it again on Java seem remote. The information available suggests a species rather similar to *B. aithorhachis*, but no median ridge on the lip is mentioned in the original description.

Acknowledgements

I owe a debt of gratitude to many people and institutions who have helped me (and still do) in many ways with my self-imposed task of revising as many sections of *Bulbophyllum* as I possibly can. Here, I can mention only a few. The spirit samples made from the extensive living collections in the Botanic Gardens in Leiden, and the by now almost legendary, but unfortunately no longer existing, living collection of *Bulbophyllum* of P. Jongejan, Amersfoort (both in the Netherlands, the material kept in L) must be mentioned. The herbaria AAU, AMES, B, BM, BRI, BO, C, F, K, KEP, KLU, L, LAE, NY, P, PE, S, SZU, SAN, UKMB, W, WU have made material available for study. Jim Cootes (Australia), Bob & Chittima Cowen (Thailand), Bev Debrincat (Australia), Gunter Fischer (Austria), Alexander Kocyan (The Netherlands), Alvin Lok (Singapore), Peter O'Byrne (Singapore), Anton Sieder (Austria), Heok Hui Tan (Singapore) provided material of several rare species. J.F. Veldkamp (The Netherlands) provided the Latin diagnoses.

References

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- Seidenfaden, G. 1979. Orchid genera in Thailand 8: *Bulbophyllum* Thou. *Nordic Journal Botany* **33**, 3: 1—228.
- Vermeulen, J.J. 1993. A taxonomic revision of the genus *Bulbophyllum*, sections *Adelopetalum*, *Lepanthanthe*, *Macrouris*, *Pelma*, *Peltopus* and *Uncifera*. *Orchid Monographs* **7**: 1—324.

Identification lists

This identification list includes all collections examined for this revision.

Identification list sorted according to the species:

111 - *Bulbophyllum penduliscapum* - Beccari, O. PB 3113; PB 3144; Hort. Bogor HLB 905.234-4797; HLB 924.325-179; Hort. Bogor, comm. nr. 008; 064; 091; 134; 420; Hort. Leiden 026209; Jacobson, E.R. s.n.; Jongejan, P. cult. 2990; Lamb, A. 1989/1105; SAN (Amin & Sign) 069164; (Lamb, A.) 092332; Tenom Orchid Centre (T.O.C.) cult. 1787; Vermeulen, J.J. 1158; 1302; Vermeulen, J.J., & Duistermaat, H. 1147; Wenzel, C.A. 761; 865.

112 - *Bulbophyllum gymnopus* - Clarke, C.B. 42549; F.K.W. 7705; Herb. Hooker f. s.n.; Griffith 5133; 5134; Hort. Kew EN 596-68; King's collectors s.n.; Pantling, R. 357; Parry, N.E. 484; Seidenfaden, G. & Smitinand, T. (GT) 8643; 8869; Tessier-Yandell 02.

113a - *Bulbophyllum farinulentum* subsp. *farinulentum* - Beaman, J.H. (et al.) 07006; Carr, C.E. 0106; FRI (Ng, F.S.P.) 27102; Hort. Leiden 020771; 026544; 914306; Hort. Singapore SBG-O 0594; Kerr, A.F.G. 113; Lamb, A. s.n. (Supat, A.) 1989/ 1101; SAN (Fidilis Krispinus) 118814.

113b - *Bulbophyllum farinulentum* subsp. *densissimum* - Hort. Leiden 914076; SAR (Ashton, P.S.) 16531; Syngé, P.M. 98.

114 - *Bulbophyllum fulvibulbum* - Hort. Leiden 930900; 970299; Jongejan, P. cult. 1814; Vermeulen, J.J. 0603.

115 - *Bulbophyllum nemorale* - BSC (Fenix, E.) 28356; Kalkman, C., & Tissing, M.O. 4187; PNH (Edano, G.E.) 12707; Wenzel, C.A. 871; 922; 928.

116 - *Bulbophyllum disjunctum* - Argent, G. & Coppins, B. 1167; Bakhtiar Effendi bin Yahya 56; Beaman, J.H. (et al.) 06764; (et al.) 07238; (et al.) 11128; Carr, C.E. 3212; Clemens, J., & Clemens, M.S. 00254; 27361; 32554; 32787; 40226; Collenette, S. 1002; Comber, J. 103; FRI (Saw, L.G.) 71675; Lamb, A. 1983/ 158; 1990/ 1246; Mahadimenakbar 64; Nor Hashimah Abu Hani 44; SAN (Aban Gibot) 056304; (Lamb, A.) 087497; SAR (Native coll.) 05049; (Asah Ak Luang) 22741; (Chai, P.) 33968; (Martin, P.J.) 38167; (Ilias Paie) 40717; (Awa, D., & Yii, P.C.) 46827; (Yii, P.C., & Abu Talib) 58237; (Yii, P.C., & Abu Talib) 58476; Sato, T. 0793; (et al.) 1849; SFN (Moulton, J.C.) 06664; UKM (Mohd. Kasim) 23704; Vermeulen, J.J., & Duistermaat, H. 0697; Vogel, E.F. de 8212.

117 - *Bulbophyllum placochilum* - Clemens, J., & Clemens, M.S. 33922; 34056; SFN (Carr, C.E.) 27938.

118 - *Bulbophyllum elongatum* - Blume, C.L. 195; 287; s.n.; HLB 902.322-934; BSC (Loher, A.) 14730; Carr, C.E. (1929/03) s.n.; Curtis, G. s.n.; Elmer, A.D.E. 09823; Grieve, H.G. 32; Hort. Leiden 026216; Mohd. Shah 2788; Reeve, T.M. 1098; 6025; Ridley, H.N. (1893) s.n.; (1893) s.n.; (1908/11) s.n.; Royen, P. van, Sleumer, H., & Schram, F. 7795; Sands, M.J.S. 5285; SAR (Lai, S.T., Rantai, &

Awg Enjah) 75308; SFN (Holttum, R.E.) 21582; Wenzel, C.A. 351; 704.

119 - *Bulbophyllum lissoglossum* - Carr, C.E. 3371; Clemens, J., & Clemens, M.S. 29820; Griswold J.A. 79; SAN (Lamb, A., "KL. 3021") 087149; (Lamb, A., "LKC 3190") 091580; SFN (Carr, C.E.) 27249; Vermeulen, J.J., & Chan, C.L. 0390; Vermeulen, J.J., & Duistermaat, H. 1086.

120 - *Bulbophyllum gemma-reginae* - Jongejan, P. cult. 1856.

121 - *Bulbophyllum carinilabium* - Beaman, J.H. 08952; Hort. Leiden 026443; Sato, T. 0265; SFN (Carr, C.E.) 26987; Vermeulen, J.J. 0641a.

122 - *Bulbophyllum hirtulum* - Ahmad (1894) s.n.; Ajoeb (Exp. Jacobson, E.R.) 807; Carr, C.E. 0194; (1933/03) s.n.; Chan, C.L. s.n.; Collenette, S. 0719; Hort. Bogor HLB 920.342-4; Hort. Leiden 913046; 914195; 970483; Hort. Singapore (Carr, C.E., & Holttum, R.E.) s.n.; (Ridley) (1909) s.n.; (Tan, H.H.) SBG-O 0316; SBG-O 2166; Korthals, P.W. s.n.; Lewis, G.P. 291; Ridley, H.N. & Curtis, G. (1899/03) s.n.; Tenom Orchid Centre (T.O.C.) cult. 1203; Vermeulen, J.J. 0636.

123 - *Bulbophyllum cerebellum* - Carr, C.E. 3470; Giles 998; Kocyan, A. (1999/10/22) s.n.

124 - *Bulbophyllum clipeibulbum* - Hort. Salzburg OR 637/94; Hort. Singapore SBG-O 2087.

125 - *Bulbophyllum penicillium* - Hort. Glasnevin s.n.; (1917/05/24) s.n.; O'Brien, J. cult. (1895/06) s.n.; Pantling, R. 251; Parish, C. 303; Prain's collector 89.

126 - *Bulbophyllum setuliferum* - FRI (Saw, L.G.) 44299; Hort. Singapore SBG-O 0490; SBG-O 0499; SBG-O 0625; Lok, F.A. cult. 053.

127 - *Bulbophyllum sororculum* - Brans, M. s.n.

128 - *Bulbophyllum aithorhachis* - Jongejan, P. cult. 2219; Schrage, A.H. (1954/03/01) s.n.

129 - *Bulbophyllum echinochilum* - Hort. Muenchen (Loher) (1916/12) s.n.

130 - *Bulbophyllum lanuginosum* - Thaitong 1395.

131 - *Bulbophyllum atratum* - Chang, C.K. cult. s.n.; Hort. Bogor s.n.; HLB 921.250-380; Hort. Singapore SBG-O 0087; Jacobson, E.R. s.n.

132 - *Bulbophyllum groeneveldtii* - Hort. Leiden 026335; Jacobson, E.R. cult. (Groeneveldt) 951; Jongejan, P. cult. 1818; Vermeulen, J.J., & Duistermaat, H. 0971; 1107.

133 - *Bulbophyllum grotianum* - Hort. Leiden 970530.

134 - *Bulbophyllum janus* - Micholitz, W. s.n.; Robinson, H.C., & Boden Kloss, C. (1914/03/15) s.n.

135 - *Bulbophyllum xiphion* - Hort. Leiden 913241; Vogel, E.F. de. & Cribb, P.J. 9062.

136 - *Bulbophyllum mirabile* - Hort. Bogor HLB 908.100-122; HLB 924.325-695; Hort. Bogor . comm. nr. 006; 036; 153; Hort. Glasnevin s.n.; Hort. Leiden 949339; Jongejan, P. cult. 4031.

138 - *Bulbophyllum polycyclum* - Hort. Leiden 913457; Jongejan, P. cult. 1870.

- 139 - *Bulbophyllum lindleyanum*** - Day, J. 63; F.F. 48; Foerstermann, I.F. 08; Herb. Reichenbach, H.G. (Foerstermann) 15563; Hort. Singapore SBG-O 2185; SBG-O 2186; Lok, F.A. cult. 057; Seidenfaden, G. & Smitinand, T. (GT) 6139; SFN (Haniff & Nur) 02702; (Haniff & Nur) 10301.
- 140 - *Bulbophyllum tremulum*** - Beddome, R.H. 8179; Herb. Reichenbach, H.G. (Wight) 49425; Hort. Kew (1925/04/27) s.n.; Hort. Leiden 022802; Jongejan, P. cult. 4544; Lawrence, T. cult. (1901/02/28) s.n.; Meebold, A. 8533.
- 141 - *Bulbophyllum scaphiforme*** - Hort. Vienna 1992/ 182; Seidenfaden, G. & Smitinand, T. (GT) 2099; 7464; 8332; 8332a; Tixier, P. s.n.
- 142 - *Bulbophyllum nigripetalum*** - Henry, A. 13055; Hort. Glasnevin (1892/05) s.n.; Hort. Kew (1915/01) s.n.; (1916/03/13) s.n.; (1919/05/22) s.n.; Lawrence, T. cult. (1899/04) s.n.; Maxwell, J.F. 1989/ 524; Morrison, A. 1032; O'Brien, J. cult. (1888) s.n.; (1889/04) s.n.; (1891/05/18) s.n.; Seidenfaden, G. & Smitinand, T. (GT) 7656.
- 143 - *Bulbophyllum nigrescens*** - Cumberlege 1021; Hort. Aarhus 1978/ B-232; Hort. Vienna 099B 104; 1995/ 446; Jongejan, P. cult. 2591; Kerr, A.F.G. 084; (1915/03/14) s.n.; Lawrence, T. cult. (1898/02) s.n.; Maxwell, J.F. 1989/ 523; Menzies, D., & Dupuy, D. 328; Seidenfaden, G. & Smitinand, T. (GT) 8332b; Smitinand, T. 10168.
- 144 - *Bulbophyllum trulliferum*** - Tenom Orchid Centre (T.O.C.) cult. 2321.
- 145 - *Bulbophyllum jolandae*** - Vermeulen, J.J. 0602.
- 146 - *Bulbophyllum comberipictum*** - Hort. Leiden 914194.
- 147 - *Bulbophyllum lasioglossum*** - Borden, T.E. 797; Elmer, A.D.E. 17687; Topping, D. LeRoy (1904/05) s.n.
- 148 - *Bulbophyllum negrosianum*** - Elmer, A.D.E. 09821; Hort. Vienna 1990/ 176.
- 149 - *Bulbophyllum dracunculus*** - Carr, C.E. 3647; Clemens, J., & Clemens, M.S. 32908; Collenette, S. 0535; Hort. Leiden 030978.
- 150 - *Bulbophyllum polygaliflorum*** - Carr, C.E. 3595; Hansen, C. 499; SFN (Carr, C.E.) 27956.
- 151 - *Bulbophyllum ochthodes*** - Hort. Singapore SBG-O 0616.
- 152 - *Bulbophyllum phreatiopse*** - Hoogland, R.D. & Craven, L.A. 10899; Reeve, T.M. 5772.
- 153 - *Bulbophyllum parviflorum*** - Cooper, R.E. 1239; Hort. Glasnevin (1914/10) s.n.; (1915/10/13) s.n.; Hort. Leiden 960104; Jongejan, P. cult. 1974; King, G. s.n.; Pantling, R. 245; Parish, C. 305; Seidenfaden, G. & Smitinand, T. (GT) 8524; 8549; Thomson (1850) s.n.
- 154 - *Bulbophyllum secundum*** - Beusekom, C.F. van, & Phlengkhlai, C. 1271; Evrard, F. 1018; Garrett, H.B.G. 795; Grey-Wilson & Phillips 93; Hort. Glasnevin (1904/07) s.n.; Jongejan, P. cult. 0303; 0889; Kerr, A.F.G. 180; Maxwell, J.F. 1988/ 685; Pantling, R. 214; Prain, D. 41; Samuel, A. 13549; Sander cult. (1895/06) s.n.; Swinhoe, R. 122; Tsi, Z.H. 1991/ 544; White, K. 406.
- 155 - *Bulbophyllum debrincatae*** - Debrincat, B. cult. (leg. Cootes, J.E.) 001.

156 - *Bulbophyllum pilosum* - Vermeulen, J.J. 0562.

157 - *Bulbophyllum xenosum* - Jongejan, P. cult. 4425.

158 - *Bulbophyllum limbatum* - Burkill, H.M. 1789; Carr, C.E. (1920/08) s.n.; Hort. Bogor HLB 914,150-360; HLB 921,250-248; Hort. Leiden 960104; 970478; Hort. Singapore (1932/08) s.n.; Jeppesen, H.L. (1920/08) s.n.; Jongejan, P. cult. 3995; 4256; Lamb, A. 1988/ 925; Loddiges, C. s.n.; Mohd. Shah & Kadim 383; SAN (Dewol Dundaling) 134960; SFN (Moulton, J.C.) 06757; (Moulton, J.C.) 06758; Tenom Orchid Centre (T.O.C.) cult. (Lamb, A.) (1989/01) s.n.; Teruya, Z. 1890.

159 - *Bulbophyllum rariflorum* - Hort. Bogor (1909) s.n.; HLB 913,114-114; II. M.C. 133; Hort. Bogor , comm. nr. 116; 128; 130; 136; Jongejan, P. cult. 2013; 2214.

*** - *Bulbophyllum sarcoscapum*** - Zollinger, H. 947.

Identification list sorted according to the specimens:

The identifications are given as numbers between square brackets. These numbers correspond with the species numbers in this revision. To facilitate the use of the identification lists, an enumeration of the taxa with their numbers is given.

- | | |
|---|---|
| [111] <i>B. penduliscapum</i> J.J. Sm. | [135] <i>B. xiphion</i> J.J. Verm. |
| [112] <i>B. gymnopus</i> Hook.f. | [136] <i>B. mirabile</i> Hallier. |
| [113] <i>B. farinulentum</i> J.J. Sm. | [137] <i>B. spadiceiflorum</i> Tixier. |
| [113a] ssp. <i>farinulentum</i> | [138] <i>B. polycyclum</i> J.J. Verm. |
| [113b] ssp. <i>densissimum</i> (Carr) J.J. Verm. | [139] <i>B. lindleyanum</i> Griff. |
| [114] <i>B. fulvibulbum</i> J.J. Verm. | [140] <i>B. tremulum</i> Wight |
| [115] <i>B. nemorale</i> L.O Williams | [141] <i>B. scaphiforme</i> J.J. Verm. |
| [116] <i>B. disjunctum</i> Ames & C. Schweinf. | [142] <i>B. nigripetalum</i> Rolfe |
| [117] <i>B. placochilum</i> J.J. Verm. | [143] <i>B. nigrescens</i> Rolfe |
| [118] <i>B. elongatum</i> (Blume) Hassk. | [144] <i>B. trulliferum</i> J.J. Verm. |
| [119] <i>B. lissoglossum</i> J.J. Verm. | [145] <i>B. jolandae</i> J.J. Verm. |
| [120] <i>B. gemma-reginae</i> J.J. Verm. | [146] <i>B. comberipictum</i> J.J. Verm. |
| [121] <i>B. carinilabium</i> J.J. Verm. | [147] <i>B. lasioglossum</i> Rolfe ex Ames |
| [122] <i>B. hirtulum</i> Ridl. | [148] <i>B. negrosianum</i> Ames |
| [123] <i>B. cerebellum</i> J.J. Verm. | [149] <i>B. dracunculus</i> J.J. Verm. |
| [124] <i>B. clipeibulbum</i> J.J. Verm. | [150] <i>B. polygaliflorum</i> J.J. Wood |
| [125] <i>B. penicillium</i> Par. & Rchb.f. in Rchb.f. | [151] <i>B. ochthodes</i> J.J. Verm. |
| [126] <i>B. setuliferum</i> J.J. Verm. & L.G. Saw | [152] <i>B. phreatiopse</i> J.J. Verm. |
| [127] <i>B. sororculum</i> J.J. Verm. | [153] <i>B. parviflorum</i> Par. & Rchb.f. in Rchb.f. |
| [128] <i>B. aithorhachis</i> J.J. Verm. | [154] <i>B. secundum</i> Hook.f. |
| [129] <i>B. echinophilum</i> Kraenzl. | [155] <i>B. deprincatae</i> J.J. Verm. |
| [130] <i>B. lanuginosum</i> J.J. Verm. | [156] <i>B. pilosum</i> J.J. Verm. |
| [131] <i>B. atratum</i> J.J. Sm. | [157] <i>B. xenosum</i> J.J. Verm. |
| [132] <i>B. groeneveldtii</i> J.J. Sm. | [158] <i>B. limbatum</i> Lindl. |
| [133] <i>B. grotianum</i> J.J. Verm. | [159] <i>B. rariflorum</i> J.J. Sm. |
| [134] <i>B. janus</i> J.J. Verm. | [*] <i>B. sarcoscapum</i> Teysm. & Binn. |

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- 1 *Bulbophyllum penduliscapum* J.J. Sm. (111). – *Jongejan cult.* 2990 (P. Jongejan).
- 2 *Bulbophyllum farinulentum* J.J. Sm. ssp. *densissimum* (Carr) J.J. Verm. (113b). — *Hort. Leiden* 914076 (A. Schuiteman).
- 3 *Bulbophyllum fulvibulbum* J.J. Verm. (114). — *Hort. Leiden* 930285 (A. Meivogel).
- 4 *Bulbophyllum disjunctum* Ames & C. Schweinf. (116). – *Hort. Leiden* 980182 (A. Schuiteman).



- 5 *Bulbophyllum gemma-reginae* J.J. Verm. (120). — *Jongejan cult.* 1856 (P. Jongejan).
- 6 *Bulbophyllum carinilabium* J.J. Verm. (121). — *Hort. Leiden* 26443 (A. Schuiteman).
- 7 *Bulbophyllum cerebellum* J.J. Verm. (123). — *Kocyan s.n.* (A. Kocyan).
- 8 *Bulbophyllum clipeibulbum* J.J. Verm. (124). — *Hort. Vienna* 099B160-2 (G. Fischer).
- 9 *Bulbophyllum penicillium* Par. & Rchb.f. in Rchb.f. (125). — (P. Jongejan).



- 10 *Bulbophyllum setuliferum* J.J. Verm. & L.G. Saw (126). — *Hort. Singapore SBG-O 499* (P. O'Byrne).
- 11 *Bulbophyllum sororculum* J.J. Verm. (127). — *M. Brans s.n.* (M. Brans).
- 12 *Bulbophyllum aithorhachis* J.J. Verm. (128). — *Jongejan cult. 2219* (P. Jongejan).
- 13 *Bulbophyllum aithorhachis* J.J. Verm. (128). — *Jongejan cult. 2219* (P. Jongejan).
- 14 *Bulbophyllum atratum* J.J. Sm. (131). — *Hort. Singapore SBG-O 087* (P. O'Byrne).



- 15 *Bulbophyllum groeneveldtii* J.J. Sm. (132). — *Jongejan cult. 1818* (P. Jongejan).
- 16 *Bulbophyllum grotianum* J.J. Verm. (133). — *Hort. Leiden 970603* (A. Schuiteman).
- 17 *Bulbophyllum grotianum* J.J. Verm. (133). — *Hort. Leiden 970603* (A. Schuiteman).
- 18 *Bulbophyllum xiphion* J.J. Verm. (135). — *Hort. Leiden 913241* (P. Jongejan).
- 19 *Bulbophyllum xiphion* J.J. Verm. (135). — *Cribb 9062* (P. Cribb).



- 20 *Bulbophyllum mirabile* Hallier, flowers near the base of the inflorescence (136). – *Jongejan cult.* 4031 (P. Jongejan).
- 21 *Bulbophyllum mirabile* Hallier, flowers near the top of the inflorescence (136). – *Jongejan cult.* 4031 (P. Jongejan).
- 22 *Bulbophyllum polycyclum* J.J. Verm. (138). – *Jongejan cult.* 1870 (P. Jongejan).
- 23 *Bulbophyllum lindleyanum* Griff. (139). – *Hort. Vienna s.n.* (A. Sieder).
- 24 *Bulbophyllum tremulum* Wight (140). — *Jongejan cult.* 4544 (P. Jongejan).
- 25 *Bulbophyllum nigripetalum* Rolfe (142). – *Hort. Vienna O2044* (A. Sieder).



- 26 *Bulbophyllum nigrescens* Rolfe (143). – *Jongejan cult.* 2591 (P. Jongejan).
- 27 *Bulbophyllum nigrescens* Rolfe (143). – *Hort. Vienna* 446.95 (A. Sieder).
- 28 *Bulbophyllum trulliferum* J.J. Verm. (144). — *Tenom Orchid Centre (T.O.C.) cult.* 2321 (A. Lamb).
- 29 *Bulbophyllum lasioglossum* Rolfe ex Ames (147). — (M. Clements).
- 30 *Bulbophyllum negrosianum* Ames (148). – *Hort. Vienna cult.* (A. Sieder).



- 31 *Bulbophyllum dracunculus* J.J. Verm. (149). – *Hort. Leiden* 30978 (P. Jongejan).
- 32 *Bulbophyllum ochthodes* J.J. Verm. (151). — *Hort. Singapore* SBG-O 616 (P. O'Byrne).
- 33 *Bulbophyllum parviflorum* Par. & Rchb.f. in Rchb.f (153). – *Jongejan cult.* 1974 (P. Jongejan).
- 34 *Bulbophyllum secundum* Hook.f. (154). – *Jongejan cult. s.n.* (P. Jongejan).
- 35 *Bulbophyllum secundum* Hook.f. (154). – *Jongejan cult. s.n.* (P. Jongejan).



- 36 *Bulbophyllum deprincatae* J.J. Verm. (155). – *Debrincat cult.* (leg. Cootes) 001 (D. Titmuss).
- 37 *Bulbophyllum xenosum* J.J. Verm. (157). — *Jongejan cult.* 4425 (P. Jongejan).
- 38 *Bulbophyllum limbatum* Lindl. (158). – *Jongejan cult.* (P. Jongejan).

